

DOCUMENT RESUME

ED 136 031

08

CE 010 177

AUTHOR Kettner, Joseph K., Jr.
TITLE Determining Performance Levels of Competencies for Job Entry of Data Processing Programmers. Final Report.
INSTITUTION District 1 Technical Inst., Eau Claire, Wis.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.; Wisconsin State Board of Vocational, Technical, and Adult Education, Madison.
BUREAU NO 03-009-151-226
PUB DATE Jun 76
NOTE 127p.; Some tables may be marginally legible
EDRS PRICE MF-\$0.83 HC-\$7.35 Plus Postage.
DESCRIPTORS Associate Degrees; Curriculum Research; *Data Processing; Data Processing Occupations; Employee Attitudes; Employer Attitudes; Graduates; Graduate Surveys; *Job Skills; *Programers; State Surveys; *Task Analysis; Technical Education
IDENTIFIERS Wisconsin

ABSTRACT

A study was conducted to determine the performance levels of competencies for job entry as a data processing programmer. Specifically, the study sought to answer: (1) What tasks are performed by entry level programmers? (2) How frequently are these tasks performed? (3) What level of performance is necessary for these tasks? (4) How important are these tasks? and (5) What is the future projected need for these tasks? Both questionnaire and followup interviews were used. The population consisted of all data processing associate degree programing graduates at nine Wisconsin vocational, technical, and adult schools for 1973 to 1975 and their supervisors/employers. A questionnaire was developed in which respondents were asked to rate each of 75 tasks on a five-point scale relevant to four criteria: Frequency, performance, importance, and future need. Questionnaires were mailed to each of 508 graduates (one for the graduate, and one for his employer/supervisor). There was approximately 50% response. Followup interviews were conducted with 26 graduates and 21 employers to supplement and verify the data. Both graduates and employers tended to rank the four areas the same for all six groups of tasks (systems analysis and design, program design, coding, testing and debugging, documentation, and miscellaneous). Interviews indicated that many businesses are using or are considering an on-line system in the near future. It was concluded that the Wisconsin vocational, technical, and adult education system is currently emphasizing the proper tasks needed for entry-level programmers. Many employers indicated that operation experience was very important to being a successful entry-level programmer. (Recommendations are included and the questionnaire, interview guides, and complete findings and data analysis are included.) (LAS)

Documents acquired by ERIC include many informal unpublished materials not available from other sources. ERIC makes every effort to obtain the best copy available. Nevertheless, items of marginal reproducibility are often encountered and this affects the quality of the microfiche and hardcopy reproductions ERIC makes available via the ERIC Document Reproduction Service (EDRS). EDRS is not responsible for the quality of the original document. Reproductions supplied by EDRS are the best that can be made from the original.

ED136031

FINAL REPORT

Federal Project No. 03-009-151-226
District No. 01-005-151-226

DETERMINING PERFORMANCE LEVELS OF COMPETENCIES FOR
JOB ENTRY OF DATA PROCESSING PROGRAMMERS

Joseph N. Kettner, Jr.

DISTRICT ONE TECHNICAL INSTITUTE
Eau Claire, Wisconsin

June, 1976

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRO-
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIGIN-
ATING IT. POINTS OF VIEW OR OPINIONS
STATED DO NOT NECESSARILY REPRESENT
OFFICIAL NATIONAL INSTITUTE OF
EDUCATION POSITION OR POLICY

The research reported herein was performed pursuant to a grant or contract with the Wisconsin Board of Vocational, Technical and Adult Education, partially reimbursed from an allocation of Federal funds from the U. S. Office of Education, U. S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official State Board or U. S. Office of Education position or policy.

BEST COPY AVAILABLE

ACKNOWLEDGMENTS

The writer would like to thank the following people who helped make this study possible:

Wayne Atkins, for his patience, suggestions, and technical competence;

Ron Porath and Lloyd Kragenbring, local data processing advisory committee members, for their many hours of time in making the study pertinent;

John Moseng, Milo Swenson, and Paul Almquist, data processing instructors, for their assistance in collecting data and proofreading;

Judy Ferber, Sue Berg, and Sandy O'Donahoe, for their professional secretarial assistance;

Laurie DeVuyt, Gateway Technical Institute, for her cooperation in collecting data for the study;

Joyce, my wife, for her consideration during the past six months; and

all the others who assisted in any way toward the completion of this study.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGMENTS	ii
LIST OF TABLES.	v
 CHAPTER	
I. INTRODUCTION.	1
Need for the Study.	1
Statement of the Problem.	2
Purpose for the Study	2
Limitations of the Study.	3
Delimitations of the Study.	3
II. RELATED LITERATURE.	4
III. PROCEDURES.	7
Selection of Population	7
Preparation of Questionnaire.	7
Administration of Questionnaire	9
Tabulation of Completed Questionnaire	10
IV. FINDINGS.	12
Introduction.	12
Returns	12
Questionnaire Data.	16
Follow-Up Interviews.	41
V. CONCLUSIONS AND RECOMMENDATIONS	48
Conclusions	48
Recommendations	49

A P P E N D I X

- A - Original task list
- B - Letter to employee receiving survey instrument
- C - Follow-up letter to employee receiving survey instrument
- D - Letter to employer receiving survey instrument
- E - Informational cover sheet for survey instrument
- F - Survey instrument
- G - Graduate interview guide
- H - Employer interview guide
- I - Summary of graduate answers to interview
- J - Summary of employer answers to interview
- K - Graduate answers to other tasks on survey instrument
- L - Employer answers to other tasks on survey instrument
- M - Graduate survey responses by frequency count
- N - Employer survey responses by frequency count
- O - Ranks, mean, standard error of the mean, standard deviation, standard error of the standard deviation, and rank difference for all tasks by item number
- P - Ranks for all tasks by description
- Q - Letter for respondent

LIST OF TABLES

TABLE	PAGE
4.1A. Questionnaire Mailings and Returns For Graduates	12
4.1B. Responses By Number Of Programmers Employed In Installation	13
4.1C. Experience Of Respondents By Number Of Years Of Programming.	13
4.2. Employment Status Of Graduate Respondents.	14
4.3. Employer Responses	14
4.4. Respondent Returns By Districts.	15
4.5. Ranking Of Tasks Performed In Systems Analysis and Design In Terms Of Frequency Of Performance For Entry Level Programmers.	17
4.6. Ranking Of Tasks Performed In Program Design In Terms Of Frequency Of Performance For Entry Level Programmers.	18
4.7. Ranking Of Tasks Performed In Coding In Terms Of Frequency Of Performance For Entry Level Programmers.	19
4.8. Ranking Of Tasks Performed In Testing and Debugging In Terms Of Frequency Of Performance For Entry Level Programmers.	20
4.9. Ranking Of Tasks Performed In Documentation In Terms Of Frequency Of Performance For Entry Level Programmers.	21
4.10. Ranking Of Miscellaneous Tasks Performed In Terms Of Frequency Of Performance For Entry Level Programmers.	22
4.11. Ranking Of Tasks Performed In Systems Analysis and Design In Terms Of Proficiency Needed By Entry Level Programmers.	23

TABLE	PAGE
4.12. Ranking Of Tasks Performed In Program Design In Terms Of Proficiency Needed By Entry Level Programmers.	24
4.13. Ranking Of Tasks Performed In Coding In Terms Of Proficiency Needed By Entry Level Programmers	25
4.14. Ranking Of Tasks Performed In Testing and Debugging In Terms Of Proficiency Needed By Entry Level Programmers.	26
4.15. Ranking Of Tasks Performed In Documentation In Terms Of Proficiency Needed By Entry Level Programmers.	27
4.16. Ranking Of Miscellaneous Tasks Performed In Terms Of Proficiency Needed By Entry Level Programmers.	28
4.17. Ranking Of Tasks Performed In Systems Analysis and Design In Terms Of Mastery Of The Task By Entry Level Programmers.	29
4.18. Ranking Of Tasks Performed In Program Design In Terms Of Mastery Of The Task By Entry Level Programmers.	30
4.19. Ranking Of Tasks Performed In Coding In Terms Of Mastery Of The Task By Entry Level Programmers. . . .	31
4.20. Ranking Of Tasks Performed In Testing and Debugging In Terms Of Mastery Of The Task By Entry Level Programmers	32
4.21. Ranking Of Tasks Performed In Documentation In Terms Of Mastery Of The Task By Entry Level Programmers.	33
4.22. Ranking Of Miscellaneous Tasks Performed In Terms Of Mastery Of The Task By Entry Level Programmers.	34
4.23. Ranking Of Tasks Performed In Systems Analysis and Design In Terms Of Future Need Of The Task For Entry Level Programmers.	35
4.24. Ranking Of Tasks Performed In Program Design In Terms Of Future Need Of The Task For Entry Level Programmers.	36

TABLE	PAGE
4.25. Ranking Of Tasks Performed In Coding In Terms Of Future Need Of The Task For Entry Level Programmers.	37
4.26. Ranking Of Tasks Performed In Testing and Debugging In Terms Of Future Need Of The Task For Entry Level Programmers	38
4.27. Ranking Of Tasks Performed In Documentation In Terms Of Future Need Of The Task For Entry Level Programmers.	39
4.28. Ranking Of Miscellaneous Tasks Performed In Terms Of Future Need Of The Task For Entry Level Programmers.	40

CHAPTER I

INTRODUCTION.

Need for the Study

A research study titled "Research Priorities in Postsecondary Vocational, Technical and Adult Education in Wisconsin for 1975-77" was conducted in February, 1975. It was sent to administrative staff of the vocational, technical and adult education districts in Wisconsin and they were asked to rank forty-five (45) vocational research areas/topics for Wisconsin VTAE. The item that ranked second was "Determining Performance Levels of Competencies for Job Entry."

At a state meeting on research and planning, a consortia of five VTAE districts were selected to study five to ten VTAE programs to determine performance levels of competencies for job entry. The districts included were Blackhawk, Waukesha, Mid-State, Southwest and District One (Eau Claire).

District One submitted two programs and from these the data processing programmer competency area was selected by the state.

The determining of entry level competencies for the data processing programmer is very pertinent at this time because of the many changes which have occurred in recent years in data processing. Our main concerns in teaching programmers should be to maintain relevancy of curriculum content, instructional processes, competencies and performance levels to be achieved. Programmers hired today are required to begin

writing programs, from the day they are hired, rather than only know some body of knowledge since emphasis is on performance.

What are the competencies and performance levels needed to be a successful entry level programmer? These things must be determined before data processing curriculum can be effectively evaluated and perhaps revised. The identification and analysis of the tasks performed by programmers is the initial step in developing efficient data processing programmer curricula.

Statement of the Problem

The problem researched in this study was a determination of the performance levels of competencies for job entry as a data processing programmer.

Specifically, the study sought to answer the following questions:

1. What tasks are performed by entry level programmers?
2. How frequently are these tasks performed?
3. What level of performance is necessary for these tasks?
4. How important are these tasks?
5. What is the future projected need for these tasks?

Purpose for the Study

The basic purpose of the study was to determine the competencies that are needed by data processing graduates so they may become successful programmers in the world of work. The study sought to obtain information that would be valuable to the vocational-technical schools in planning their curricula in data processing to better meet these students' needs. The results of the study will enable the vocational-

technical schools in the state to re-evaluate their data processing programs. The results will be used to modify or maintain existing data processing curricula.

Limitations

This study is limited by the following factors:

1. The number of questionnaires returned.
2. The data processing task descriptions used in the questionnaire are subject to varying definitions and interpretations.
3. The human element as it affects this writer and those surveyed.

Delimitations of the Study

The area studied is restricted to the two year data processing programs as approved by the Wisconsin State Board of Vocational, Technical and Adult Education. The two year data processing program is offered in nine of the state's postsecondary vocational-technical schools. For a listing of the nine districts, refer to chapter 3.

The population of this study is limited to those students who graduated from a two year data processing program in 1973, 1974, and 1975, and are employed in data processing, and their supervisors.

CHAPTER II

RELATED LITERATURE

Studies dealing with computer programming tasks and curricula were reviewed for information pertinent to this study.

Regular evaluations of the data processing curriculum can assist in keeping the data processing program relevant to the needs of the community in this rapidly changing technological field.

An article in the American Vocational Journal said the following about vocational teachers:

Their job is to train people for jobs. If their instruction is to be realistic, its content and performance standards must conform to the requirements of entry-level positions in the labor market.¹

The objectives of vocational education is to provide any student with the necessary skills and knowledge that utilize the full potential of the student's abilities and provides the employer with an employee who is immediately productive with a minimum of retraining.²

A study by Raymond M. Berger presented "the results of an investigation of what in fact programmers are and do."³ In his study, Berger

¹Dr. Soskis and Mrs. Keeton, "How To Stay In The Classroom and Keep Up With Job Changes," American Vocational Journal, p. 42, September, 1975.

²Robert M. Pesola, Sr., "Education For Employability In The Vocational School," Data Management, p. 23, December, 1974.

³Raymond M. Berger, Computer Programmer Job Analysis Reference Text, AFIPS, 1974, p. 1.

developed a list of tasks and skills and asked programmers across the nation to rate them in order of importance for their particular job.

Searches were made through the ERIC for computer programmers and performance levels in data processing using appropriate descriptors. This turned up a research report called, "Business Data Processing Occupational Performance Survey."⁴ Included in this report is a list of 474 tasks performed by data processing personnel, of which 164 deal directly with programming. In this "Business Data Processing Occupational Performance Survey" the following tasks were performed by over eighty percent of the programmers who responded:

- Desk check or debug programs after assembly or compilation,
- Isolate and correct programming errors discovered during testing,
- Test new computer programs,
- Code routine computer programs,
- Revise computer programs, and
- Test revised computer programs.⁵

A most recent related study completed in Wisconsin was in 1971 by John L. Moseng entitled "A Study to Determine the Importance of Various Aspects of Data Processing Knowledge Desired of the Beginning Programmer and the Curricular Implications of the Study." In Moseng's study, "the questionnaire asked respondents to rate sixty topics of data processing knowledge on a four point scale. The respondents were asked to rate the importance of each topic for a beginning programmer on his

⁴Sidney D. Borchert and John W. Joyner, "Business Data Processing Occupational Performance Survey, Interim Report," Ohio State University, March, 1973.

⁵Ibid.

staff."⁶ He found the following topics were rated highest by the respondents: "Debugging Procedures, Disk Organization, Program Documentation Methods, Flow Charting, System Documentation, File Access Methods, Definition of the Problem."⁷

Because of the many changes that have occurred during the past five years in data processing, the author feels a current list of entry level competencies for computer programmers in Wisconsin is necessary. This will allow the nine technical institutes in Wisconsin which offer a data processing programmer degree to re-evaluate their curriculum and make sure they are meeting the needs of their data processing graduates and the community.

⁶John L. Moseng, "A Study to Determine the Importance of Various Aspects of Data Processing Knowledge Desired of the Beginning Programmer and the Curricular Implications of this Study," Unpublished Masters Paper, UW-Whitewater, November, 1971.

⁷Ibid.

CHAPTER III

PROCEDURES

In order to obtain the information desired for this study, two research methods were ne First a questionnaire was developed an sent to collect most of the a. Second, a follow-up interview was conducted to supplement and verify the data collected from the questionnaire.

Selection of Population

The population included in this study consisted of all data processing associate degree programming graduates at the nine Wisconsin vocational, technical and adult schools for the years 1973 through 1979 and their supervisors/employers. The districts and schools included were:

District One-Eau Claire	District Nine-Milwaukee
District Two-La Crosse	District Twelve-Appleton
District Four-Madison	District Thirteen-Green Bay
District Six-Kenosha	District Fifteen-Wausau
District Eight-Waukesha	

A list of 508 data processing graduates and their addresses was obtained from the nine districts. Three duplicates were identified and eliminated.

Preparation of Questionnaire

The questionnaire was developed in two stages. First a list of data processing tasks was developed using textbooks, other research studies from the review of literature, advisory committee members,

other data processing instructors, course outlines, and the author's past experience. Please refer to original task list developed in Appendix A. The original task list was given to two local advisory committee members and three other data processing instructors for their evaluation and comments. The questionnaire was revised.

To facilitate responses the tasks were grouped into six categories as follows: analysis and design, program design, coding, testing and debugging, documentation, and miscellaneous. Each of the tasks was assigned an item number within its group for reference purposes. Gateway (Kenosha) Technical Institute was also conducting a data processing curriculum study. To avoid a duplicate mailing to the same students, a section was added to the questionnaire to collect data for both studies at the same time.

Each respondent was asked to rate a task on a five point Likert Scale relevant to four criteria: frequency, performance, importance, and future need. Each of the five points on the rating scale were defined for the respondent (refer to Appendix E).

The following people served in an advisory capacity during the development of this questionnaire:

Wayne Atkins	- Assistant Director, District One, Eau Claire
Roland Krogstad	- State Vocational Education Consultant-Research
Ron Porath	- Programmer, American National Bank, past graduate, advisory committee member
Lloyd Kragenbring	- Data Processing Manager, Gould National Batter advisory committee member
John Moseng	- Data Processing Instructor, District One
Paul Almquist	- Data Processing Instructor, District One
Milo Swenson	- Chairperson, Data Processing Department, District One
Judy Ferber	- Professional Secretary, District One

The questionnaire was sent to three data processing programmers (graduates from District One Technical Institute) and one data processing employer/supervisor for a pilot test. Each of the four individuals in the pilot test were asked for their reactions and suggestions. The questionnaire was also reviewed by a member of the state staff of vocational, technical and adult education.

The final questionnaire was developed incorporating the suggestions made by the state staff member and the pilot group (refer to Appendix C).

An informational cover letter was developed and reviewed in the same manner as the questionnaire (refer to Appendix E).

The questionnaire and the informational cover letter were completed in early February, 1976.

Administration of Questionnaire

On February 17, 1976, the questionnaires were sent to 505 data processing graduates with an appropriate cover letter signed by the State Director of Vocational, Technical and Adult Education (refer to Appendix B) and a stamped, self-addressed envelope. A pencil was included to aid in completing the questionnaire. Also included in the mailing was a second copy of the questionnaire with an appropriate cover letter signed by the State Director of Vocational, Technical and Adult Education (refer to Appendix D) and a stamped, self-addressed envelope. The graduates were asked in their letters to give this second copy to their data processing employer/supervisor for them to fill out and return. Fifty-four of these questionnaires mailed to the graduates were returned by the post office with no forwarding address. These 54 names were checked in phone books and the vocational district

registrars were contacted for more recent addresses and 32 were remailed. On March 3, 1976, 357 follow-up questionnaires were sent to non-returnees with an appropriate follow-up letter (refer to Appendix). The cut-off date for return of questionnaires was April 1, 1976. After the cut-off date three supervisor and one graduate return was received and were not included in the study.

When approximately half of the returns were received, a frequency count of responses was made. Next, a guide for use in interviewing graduates and employers was developed. The interviewing was done to supplement and verify the questionnaire findings. During the weeks of March 22-26, March 29-April 2, and April 5-9, 1976, 26 graduates and 21 employers were interviewed (refer to Appendixes G and H for interview guides).

Tabulation of Completed Questionnaires

The returned questionnaires were coded and the data punched into punch cards and verified for accuracy. Each answer for a task was recorded exactly as it was indicated (example: if the 3 was circled, a 3 was recorded). A computer program was used to process the data and calculate the following statistical measures:

<u>Description</u>	<u>Formula</u>
Frequency of Response ¹	Total Number of each Answer for each Task
Mean ²	$M = \frac{\sum X}{N}$
Standard Error (SE) of the Mean (M) ²	$SE_M = \frac{SD}{\sqrt{N}}$
Standard Deviation ²	$SD = \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2}$
Standard Error (SE) of the Standard Deviation (SD) ²	$SE_{SD} = \frac{SD}{\sqrt{2N}}$

Upon completion of these statistical computations, the rank value and the mean difference of the ranks for graduates and employers were calculated manually.

¹Refer to Appendix M and N

²Refer to Appendix O

CHAPTER IV

FINDINGS

Introduction

This chapter presents the findings of the entry level competencies for data processing programmers. The chapter is divided into three parts: returns, questionnaire data, and follow-up interviews.

Returns

Tables 4.1A through 4.4 show the number of questionnaires that were mailed and returned.

TABLE 4.1A

QUESTIONNAIRE MAILINGS AND RETURNS
FOR GRADUATES

	No.	Percent
Mailed	505	--
Mailed-Delivered	480	100
Responded	216	45
No Response	264	55

In view of the fact that some of these graduates have been away from their training institution for as long as three and one-half years, this response rate appears to be satisfactory. Also some of the graduates that were not in data processing may not have returned their questionnaires.

TABLE 4.1B

RESPONSES BY NUMBER OF PROGRAMMERS
EMPLOYED IN INSTALLATION

No. Prog.	Graduates		Employers	
	No.	%	No.	%
0-5	66	48	38	47
6-25	44	32	30	37
> 25	28	20	13	16
TOTAL	138	100	81	100

Table 4.1B shows that small, medium, and large size data processing installations were well represented in the study.

TABLE 4.1C

EXPERIENCE OF RESPONDENTS
BY NUMBER OF YEARS OF PROGRAMMING

Yrs. Experience	Graduates	Employers
0-1	51	3
2-3	80	6
4-10	7	51
> 10	0	21
TOTAL	138	81

This table indicates that most of the graduates had from none to three years experience which is to be expected because they all graduated in the past three years. All of the employers indicated programming experience with most having over four years.

TABLE 4.2

STATUS OF GRADUATE RESPONDENTS

	No.	Percent
Total Responded	216	100
Currently Programmers	138	64
D. P. Related - Not Programmers	30	14
Not in Data Processing	48	22

As can be seen from this table, nearly two out of three respondents were bona fide programmers. The "Currently Programmers" group constituted the base upon which the findings were tabulated. D. P. Related and Non-D.P. were eliminated from further tabulation.

Each graduate was mailed a copy of the questionnaire which he/she was requested to give to his/her employer. Because of this technique, it is not possible to ascertain the number of potential employer respondents. Employer response was:

TABLE 4.3

EMPLOYER RESPONSES

Usable	81
Unusable	2*
TOTAL	83

Inasmuch as the number of employer respondents (83) represents 50 percent of the total graduate respondents who were working in data processing (168), this response rate for employees is viewed as being

*Employers noted that they lacked programming experience.

very good. In many instances it was indicated that one employer was completing the questionnaire after having been given a copy by two or more of his/her employees.

TABLE 4.4
RESPONDENT RETURNS BY DISTRICTS

District No.	District	Mailed Graduates	Grad. Respondents Programmer	Grad. Respondents D.P. Related Not Programmers	Grad. Respondents Not In D.P.	Employer Respondents
1	Eau Claire	45	15	5	5	9
2	La Crosse	52	7	3	10	3
4	Madison	84	19	0	4	15
6	Kenosha	74	31	3	6	12
8	Waukesha	15	0	2	1	4
9	Milwaukee	95	21	4	9	12
12	Appleton	49	12	7	6	6
13	Green Bay	36	19	1	3	11
15	Wausau	55	14	5	4	9
	TOTALS	505	138	30	48	81

Table 4.4 indicates the number of questionnaires mailed to graduates and returned for graduates and employers by district within Wisconsin.

A few respondents added comments on their returns. A copy of one letter may be found in Appendix Q.

Questionnaire Data

Tables 4.5 through 4.28 depict the following measures for the four columns of the survey (frequency, performance, importance and future need) for each of the 75 tasks listed:

1. GROUP RANK - rank within group
2. ITEM RANK - rank within entire task list
3. MEAN - AVERAGE RESPONSE - computed as indicated in chapter 3
4. STANDARD DEVIATION - computed as indicated in chapter 3

These measures are indicated for both the graduate and employer groups. The mean difference of the ranks for all 75 items between graduates and employers was 4.63 for frequency, 5.68 for performance, 6.32 for importance, and 5.44 for future need. This was not a significant difference and can be referred to in Appendix O. Appendix P lists the graduate and employer ranks for all tasks by description. Each table shows the four measures for a single task grouping.

Tables 4.5 through 4.10 deal with frequency performed.

TABLE 4.5

RANKING OF TASKS PERFORMED IN SYSTEMS ANALYSIS AND DESIGN IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
1.00	SYSTEMS ANALYSIS AND DESIGN								
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	01.	07.0	4.13	1.07	01.	09.0	4.07	1.17
1.01	USE COMPANY SYSTEM STANDARDS	02.	08.0	4.10	1.26	03.	17.5	3.65	1.65
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	03.	19.0	3.53	1.37	02.	10.5	3.99	1.29
1.08	PREPARE A PRINTER SPACING FORM	04.	34.0	3.06	1.08	04.	35.0	3.04	1.26
1.03	WORK WITH USERS ON PROBLEM	05.	37.0	2.98	1.36	05.	40.0	2.80	1.36
1.10	PREPARE A DISK RECORD LAYOUT	06.	45.0	2.59	1.20	06.	45.0	2.73	1.28
1.07	PREPARE A CARD RECORD LAYOUT	07.	49.0	2.49	1.08	07.	52.0	2.58	1.31
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM.	08.	51.0	2.40	1.27	10.	64.0	2.04	1.21
1.06	PREPARE A SYSTEM FLOWCHART	09.	55.0	2.30	1.12	09.	61.0	2.17	1.27
1.09	PREPARE A TAPE RECORD LAYOUT	10.	57.5	2.27	1.17	08.	58.0	2.28	1.23
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	11.	75.0	1.12	0.43	11.	75.0	1.33	0.82

*Mean: 1 = Never 2 = <Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

Table 4.5 indicates that among the eleven tasks within the systems analysis and design group, working with other programmers on a problem was the one most frequently performed in the opinion of both graduates and employers. This task also ranked very high in the entire task list (75 items), with graduates ranking it 7th and employers ranking it 9th. Using company system standards and working with systems analyst on problems were also rated as being frequently performed by both graduates and employers. Preparing a paper tape record layout was almost never performed by either graduates or employers. Both rated it lowest in the system analysis and design group and also lowest in the entire task list (75 items).

TABLE 4.6

RANKING OF TASKS PERFORMED IN PROGRAM DESIGN IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
2.00	PROGRAM DESIGN								
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	01.	09.0	4.05	1.11	02.	22.0	3.49	1.52
2.06	PREPARE A TEST DATA FOR PROGRAMS	02.	18.0	3.55	1.11	01.	13.5	3.81	1.03
2.01	USE STANDARD FLOWCHART SYMBOLS	03.	25.0	3.26	1.22	03.	23.5	3.44	1.39
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES.	04.	26.0	3.22	1.51	05.	38.5	2.81	1.69
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART.	05.	35.5	3.01	1.10	04.	33.0	3.11	1.27
2.10	SELECT FILE ORGANIZATION & ACCESS METHODS FOR DATA FILES	06.	47.0	2.55	1.34	08.	56.0	2.40	1.40
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	07.	50.0	2.47	1.20	06.	46.0	2.68	1.36
2.06	DIVIDE A PROGRAM INTO MODULES.	08.	59.5	2.26	1.17	07.	54.0	2.53	1.37
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM.	09.	68.0	1.78	1.28	10.	69.0	1.65	1.19
2.05	PREPARE A DECISION TABLE	10.	73.0	1.52	0.83	09.	67.0	1.79	1.01
2.04	PREPARE A GRID CHART	11.	74.0	1.23	0.55	11.	72.0	1.51	0.83

*Mean: 1 = Never 2 = < Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

In Table 4.6 the graduates chose selecting appropriate data names for data as the most frequently performed task in the program design group. Employers ranked this task number two in the group. The graduates also ranked it very high in the entire task list with a rank of 9 of 75. Use company system standards was rated most frequently performed by entry level programmers for this group and the graduates rated it second. Three tasks, select appropriate programming language for problem, prepare a decision table, and prepare a grid chart were rated lowest in the group by both graduates and employers. They were also rated very low in the entire item list by both, ranking 68, 73, and 74th by graduates and 69, 67, and 72nd by employers respectively.

TABLE 4.7
RANKING OF TASKS PERFORMED IN CODING IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
3.00	CODING								
3.26	USE CODING SHEETS.	01.	03.5	4.52	1.01	01.	03.0	4.74	0.70
3.20	WRITE COMMENTS IN PROGRAM.	02.	12.0	3.94	1.20	02.	08.0	4.16	1.08
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	03.	13.0	3.86	1.53	03.	12.0	3.91	1.62
3.16	WRITE ERROR ROUTINES	04.	17.0	3.64	1.18	07.	21.0	3.51	1.21
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	05.	20.0	3.50	1.26	08.	25.0	3.41	1.37
3.22	WRITE EDIT ROUTINES.	06.	21.5	3.42	1.13	05.	17.5	3.65	1.08
3.05	USE DISK SORT UTILITY ROUTINES	07.	23.0	3.34	1.29	04.	16.0	3.73	1.20
3.13	USE CARD FILE HANDLING ROUTINES.	08.	24.0	3.33	1.29	09.	27.0	3.32	1.43
3.17	USE LIBRARY ROUTINES	09.	27.0	3.19	1.47	06.	20.0	3.54	1.38
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	10.	28.0	3.17	1.15	11.	31.0	3.21	1.25
3.12	USE TAPE FILE HANDLING ROUTINES.	11.	29.0	3.16	1.48	12.	32.0	3.20	1.41
3.06	WRITE TABLE BUILDING INSTRUCTIONS.	12.	30.0	3.13	1.18	13.	34.0	3.07	1.28
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	13.	33.0	3.07	1.32	10.	29.0	3.29	1.39
3.15	WRITE SUBROUTINES.	14.	40.0	2.91	1.42	14.	36.0	2.98	1.36
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS.	15.	42.0	2.76	1.42	15.	37.0	2.87	1.42
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	16.	43.0	2.63	1.34	16.	48.0	2.65	1.34
3.19	USE MACROS	17.	52.0	2.37	1.49	18.	55.0	2.41	1.50
3.14	USE DATA COMMUNICATIONS ROUTINES	18.	56.0	2.28	1.42	21.	63.0	2.11	1.34
3.04	USE TAPE SORT UTILITY ROUTINES	19.	59.5	2.26	1.38	17.	53.0	2.56	1.48
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	20.	63.0	2.06	1.58	19.5	61.0	2.17	1.49
3.08	WRITE TABLE SORTING INSTRUCTIONS	21.	64.0	1.99	1.13	19.5	61.0	2.17	1.23
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS.	22.	65.0	1.95	1.43	22.	65.0	1.98	1.41
3.23	WRITE CHECK DIGIT CHECKING ROUTINES.	23.	66.0	1.88	1.09	24.	68.0	1.73	1.08
3.18	WRITE LIBRARY ROUTINES	24.	67.0	1.83	1.14	23.	66.0	1.95	1.23
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	25.	69.0	1.73	1.04	25.	70.0	1.63	0.92
3.25	WRITE FORM TEST PATTERN ROUTINES	26.	70.0	1.70	1.05	26.	73.0	1.50	0.84

*Mean: 1 = Never 2 = < Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

Table 4.7 depicts three tasks, use coding sheets, write comments in program, and write higher level language instructions ranking 1, 2, and 3 by both graduates and employers for frequency performed. These three tasks also ranked very high in the entire list. Use coding sheets held an item rank of 3, according to employers and 3.5 by graduates. Write comments in program had an item rank of 8 for employers and 12 for graduates. Write higher level language instructions ranked 12th for employers and 13th for graduates in the entire list (75 items). Write form test pattern routines ranked last in the group for both graduates and employers. For item rank the employers listed it 73rd and the graduates, 70th, indicating that it is not done very often. Write check point-restart instructions was listed second to last in the group by both groups answering questionnaires. It was also very low in item rank, rating 70th by employers and 69 by graduates.

TABLE 4.8
RANKING OF TASKS PERFORMED IN TESTING AND DEBUGGING IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
4.00	TESTING AND DEBUGGING								
4.01	READ A PROGRAM LISTING	01.	01.0	4.85	0.50	01.	01.0	4.93	0.31
4.02	DESK CHECK A PROGRAM	02.	02.0	4.54	0.74	02.	02.0	4.81	0.39
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	03.	03.5	4.52	0.79	03.	04.0	4.67	0.67
4.04	CORRECT LOGICAL ERRORS	04.	06.0	4.45	0.78	04.	05.0	4.62	0.64
4.09	TEST PROGRAM USING TEST DATA	05.	10.0	4.04	0.92	05.	06.0	4.42	0.72
4.07	READ A FILE DUMP	06.5	14.5	3.68	1.12	06.	13.5	3.81	1.12
4.08	READ A CROSS-REFERENCE LISTING	06.5	14.5	3.68	1.55	08.	19.0	3.64	1.44
4.10	TEST PROGRAM USING LIVE (USER) DATA	08.	16.0	3.65	1.07	07.	15.0	3.74	1.12
4.06	READ A MEMORY DUMP	09.	32.0	3.08	1.29	10.	30.0	3.27	1.41
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	10.	39.0	2.93	1.22	09.	28.0	3.30	1.23
4.05	READ A TRACE	11.	57.5	2.27	1.19	11.	44.0	2.74	1.31
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	12.	62.0	2.20	1.30	12.	59.0	2.25	1.25

*Mean: 1 = Never 2 = < Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

Table 4.8 indicates that among the twelve tasks within the testing and debugging group, five tasks were performed almost daily in the opinion of both graduates and employers, all having a mean (average) of above 4.0 out of five. These five tasks starting with the most frequently performed were: reading a program listing, desk checking a program, correcting syntax errors, correcting logical errors, and test program using test data. All five tasks also ranked very high in the entire task list with graduates and employers ranking reading a program listing as 1st. Graduates and employers ranked desk checking a program as 2nd. Correcting syntax errors was ranked 3.5 by graduates and 4th by employers in the entire list. Employers ranked correcting logical errors as 5th and graduates, 6th. Testing program using test data was ranked 6th by employers and 10th by graduates. Reading a trace and editing program for effective use of auxiliary storage were rated second to last and last respectively by both graduates and employers.

TABLE 4.9

RANKING OF TASKS PERFORMED IN DOCUMENTATION IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
5.00	DOCUMENTATION								
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	01.	31.0	3.11	1.22	01.	23.5	3.44	1.23
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	02.	38.0	2.96	1.19	02.	26.0	3.35	1.22
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	03.	48.0	2.51	1.27	03.	41.0	2.78	1.34
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	04.	53.5	2.34	1.30	04.	42.5	2.77	1.24
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	05.	61.0	2.25	1.22	05.	49.0	2.64	1.32

*Mean: 1 = Never 2 = < Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

Table 4.9 shows the task write computer operator instructions was indicated as being performed most frequently by both graduates and employers in the documentation group. Summarize calculations used in program was rated lowest in the group by both graduates and employers.

TABLE 4.10
RANKING OF MISCELLANEOUS TASKS PERFORMED IN TERMS OF
FREQUENCY OF PERFORMANCE FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
<u>6.00 MISCELLANEOUS</u>									
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	01.	05.0	4.49	1.15	01.	07.0	4.37	1.24
6.03	PERFORM PROGRAM MAINTENANCE.	02.	11.0	3.96	1.07	02.	10.5	3.99	1.01
6.02	PATCH COMPUTER PROGRAMS.	03.	21.5	3.42	1.48	06.	50.0	2.61	1.57
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	04.	35.5	3.01	1.62	04.	42.5	2.77	1.66
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	05.	41.0	2.81	1.58	03.	38.5	2.81	1.60
6.01	KEYPUNCH PROGRAM	06.	44.0	2.61	1.31	05.	47.0	2.67	1.32
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	07.	46.0	2.56	1.47	07.	51.0	2.59	1.55
6.07	USE VIRTUAL STORAGE TECHNIQUES	08.	53.5	2.34	1.63	08.	57.0	2.39	1.57
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE.	09.	71.0	1.56	0.83	10.	74.0	1.46	0.79
6.10	PREPARE PRINTER CARRIAGE TAPE.	10.	72.0	1.53	0.66	09.	71.0	1.59	0.77

*Mean: 1 = Never 2 = <Monthly 3 = Monthly 4 = Weekly 5 = Daily (See Appendix E)

Table 4.10 both the graduates and employers selected use job control languages as the most frequently performed task in the miscellaneous group. This task was also rated very high in the entire task list with the graduate rating it 5th and the employers, 7th. Both also chose perform program maintenance as the second most frequently performed task in the group. The least frequently performed task according to the graduates was prepare a printer carriage tape. Employers rated it 9th in the group of 10. The employers rated convert a program to another language as being the lowest in the group and the graduates rated this one 9th in the group of 10. These two tasks were also rated very low in the total list of 75 items. The graduates rated prepare a printer carriage tape 72nd and employers, 71st. Convert a program to another language was rated 74th by employers and 71st by graduates.

Tables 4.11 through 4.16 deal with the performance level or proficiency needed by entry level programmers over a range from leading others in performing the tasks to merely assisting others.

TABLE 4.11
RANKING OF TASKS PERFORMED IN SYSTEMS ANALYSIS AND DESIGN IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
1.00	SYSTEMS ANALYSIS AND DESIGN								
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	01.5	19.5	3.71	0.81	01.	09.0	3.43	0.75
1.08	PREPARE A PRINTER SPACING FORM	01.5	19.5	3.71	0.86	02.	19.5	3.36	0.83
1.10	PREPARE A DISK RECORD LAYOUT	03.	26.0	3.64	0.97	04.	31.0	3.22	0.83
1.07	PREPARE A CARD RECORD LAYOUT	04.	31.0	3.57	0.98	03.	21.0	3.33	0.89
1.09	PREPARE A TAPE RECORD LAYOUT	05.	37.0	3.49	0.96	05.	33.0	3.21	0.83
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	06.	44.5	3.37	0.89	06.	40.5	3.11	0.98
1.01	USE COMPANY SYSTEM STANDARDS	07.	46.0	3.34	0.80	08.	51.0	2.97	0.85
1.03	WORK WITH USERS ON PROBLEM	08.	52.0	3.26	0.92	09.	63.0	2.75	0.98
1.06	PREPARE A SYSTEM FLOWCHART	09.	57.5	3.21	1.06	07.	47.0	3.00	0.88
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM.	10.	69.0	2.96	0.88	10.	66.0	2.64	0.78
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	11.	75.0	2.05	1.21	11.	75.0	2.28	1.15

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix E)

Table 4.11 indicates that among the twelve tasks within the systems analysis group, working with other programmers on program and preparing a printer spacing form needed the highest performance in the opinion of the graduates. The employers rated these two tasks as 1st and 2nd also. Preparing a paper tape record layout was rated last by both graduates and employers in the group and the entire list of all items.

TABLE 4.12

RANKING OF TASKS PERFORMED IN PROGRAM DESIGN IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
<u>2.00</u>	<u>PROGRAM DESIGN.</u>								
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	01.	10.0	3.85	0.80	03.	27.0	3.26	0.96
2.08	PREPARE A TEST DATA FOR PROGRAMS	02.	21.5	3.70	0.84	01.	16.0	3.39	0.84
2.01	USE STANDARD FLOWCHART SYMBOLS	03.5	24.0	3.66	0.88	02.	23.0	3.32	0.84
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART.	03.5	24.0	3.66	0.87	04.	34.5	3.17	0.81
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	05.	31.0	3.57	0.90	05.	42.0	3.08	0.76
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES.	06.	35.0	3.51	0.94	06.	44.0	3.06	1.00
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM.	07.	48.0	3.32	1.23	09.	60.0	2.84	1.25
2.10	SELECT FILE ORGANIZATION AND ACCESS METHODS FOR DATA FILES	08.	57.5	3.21	0.99	08.	55.0	2.93	1.14
2.06	DIVIDE A PROGRAM INTO MODULES.	09.	59.0	3.19	0.90	07.	49.5	2.98	0.96
2.05	PREPARE A DECISION TABLE	10.	71.0	2.81	0.98	10.	69.0	2.59	0.83
2.04	PREPARE A GRID CHART	11.	74.0	2.33	0.97	11.	71.0	2.55	0.86

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix E)

Table 4.12 indicates graduates felt selecting appropriate data names for data needed the highest level of performance in the program design group. Employers ranked it as number 3 in the group. Prepare test data for programs was rated 1st by employers and 2nd by graduates. Prepare a grid chart was rated as needing the lowest performance by both graduates and employers. It also ranked very low in the item list, 74th by graduates, and 71st by employers of 75 items total. Prepare a decision table was rated 2nd to last in the group by both graduates and employers. It also ranked 71st for graduates and 69 for employers in the entire item list.

TABLE 4.13

RANKING OF TASKS PERFORMED IN CODING IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
3.00	CODING								
3.26	USE CODING SHEETS.	01.	01.0	4.21	0.83	01.	01.0	4.00	0.79
3.20	WRITE COMMENTS IN PROGRAM.	02.	06.0	3.92	0.91	04.	12.0	3.42	0.93
3.16	WRITE ERROR ROUTINES	03.	11.0	3.78	0.80	11.5	27.0	3.26	0.71
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	04.	66.0	3.77	0.94	17.5	53.0	2.94	1.06
3.13	USE CARD FILE HANDLING ROUTINES.	06.	14.0	3.76	0.87	07.	18.0	3.37	0.74
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	06.	34.0	3.76	0.80	11.5	27.0	3.26	0.92
3.06	WRITE TABLE BUILDING INSTRUCTIONS.	06.	29.0	3.76	0.86	13.	31.0	3.22	0.75
3.22	WRITE EDIT ROUTINES.	08.	21.5	3.70	0.86	08.	19.5	3.36	0.73
3.17	USE LIBRARY ROUTINES	09.5	27.5	3.61	0.94	09.	23.0	3.32	0.81
3.08	WRITE TABLE SORTING INSTRUCTIONS	09.5	61.5	3.61	0.85	19.	56.0	2.91	0.85
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	11.	27.5	3.60	0.85	10.	25.0	3.27	0.75
3.15	WRITE SUBROUTINES.	12.	33.0	3.55	0.98	15.	40.5	3.11	0.86
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	13.	44.5	3.54	0.89	16.	47.0	3.00	0.95
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS.	14.	41.0	3.44	0.92	20.	60.0	2.84	0.96
3.05	USE DISK SORT UTILITY ROUTINES	15.	14.0	3.41	1.01	05.5	16.0	3.39	0.83
3.12	USE TAPE FILE HANDLING ROUTINES.	16.	24.0	3.37	0.94	03.	09.0	3.43	0.80
3.14	USE DATA COMMUNICATIONS ROUTINES	17.	55.0	3.23	1.06	25.	72.5	2.53	1.01
3.19	USE MACROS	18.	60.0	3.18	1.16	17.5	53.0	2.94	1.00
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	19.	14.0	3.17	0.99	02.	09.0	3.43	0.79
3.23	WRITE CHECK DIGIT CHECKING ROUTINES.	20.	63.5	3.16	1.08	23.	68.0	2.60	0.79
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	21.	12.0	3.13	1.17	05.5	16.0	3.39	0.92
3.04	USE TAPE SORT UTILITY ROUTINES	22.	42.0	3.12	1.16	14.	38.0	3.13	0.89
3.18	WRITE LIBRARY ROUTINES	23.	67.0	3.07	1.00	22.	65.0	2.67	1.14
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS.	24.	65.0	3.00	0.82	21.	64.0	2.71	1.13
3.25	WRITE FORM TEST PATTERN ROUTINES	25.	68.0	2.98	0.99	24.	70.0	2.57	1.05
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	26.	70.0	2.94	1.17	26.	74.0	2.43	0.95

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix E)

Table 4.13 indicates that of the twenty-six items in the coding group, both graduates and employers felt the entry level programmers needed a very high performance level with the use coding sheets task. It was also ranked highest in entire item list by both graduates and employers. Write check point-restart instructions was ranked last in the coding group by both graduates and employers. It also ranked very low in the entire item list of 75 with the employers placing it 74th and the graduates, 70th.

TABLE 4.14

RANKING OF TASKS PERFORMED IN TESTING AND DEBUGGING IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
4.00	TESTING AND DEBUGGING								
4.01	READ A PROGRAM LISTING	01.	02.0	4.20	0.73	01.	02.0	3.83	0.80
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	02.	03.0	4.16	0.75	02.	03.0	3.81	0.74
4.04	CORRECT LOGICAL ERRORS	03.	04.0	4.01	0.75	05.	06.5	3.53	0.88
4.02	DESK CHECK A PROGRAM	04.	05.0	3.98	0.84	04.	05.0	3.63	0.99
4.09	TEST PROGRAM USING TEST DATA	05.5	08.5	3.89	0.75	03.	04.0	3.64	0.84
4.08	READ A CROSS-REFERENCE LISTING	05.5	08.5	3.89	0.96	06.5	12.0	3.42	0.88
4.10	TEST PROGRAM USING LIVE (USER) DATA	07.	16.0	3.74	0.81	06.5	12.0	3.42	0.96
4.07	READ A FILE DUMP	08.	17.5	3.72	0.99	08.	23.0	3.32	0.83
4.06	READ A MEMORY DUMP	09.	47.0	3.33	1.08	11.	58.0	2.87	0.96
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	10.	50.5	3.29	0.91	09.	45.0	3.03	0.94
4.05	READ A TRACE	11.	53.0	3.24	0.97	10.	57.0	2.89	0.91
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	12.	61.5	3.17	0.98	12.	62.0	2.76	1.01

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix E)

Table 4.14 indicates that in the opinion of both graduates and employers several tasks in the testing and debugging group needed a high performance level. Reading a program listing was ranked 1st in the group by both graduates and employers. In the entire item list both graduates and employers ranked it number 2. Correcting syntax errors was ranked 2nd in the group and 3rd in the entire list by both graduates and employers. The task ranked 3rd by graduates and 5th by employers was correct logical errors. In the entire list graduates ranked it 5th and employers, 6.5. Desk checking a program was ranked 4th in the testing and debugging group and 5th in the entire list of 75 items by both graduates and employers. The task which both group ranked last in this group was edit program for effective use of auxiliary storage.

TABLE 4.15

RANKING OF TASKS PERFORMED IN DOCUMENTATION IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
5.00	DOCUMENTATION								
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	01.	31.0	3.57	0.88	01.	39.0	3.12	0.97
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	02.	38.0	3.47	0.86	02.	43.0	3.07	0.96
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	03.	50.5	3.29	0.97	03.	47.0	3.00	0.98
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	04.5	55.0	3.23	0.89	04.	49.5	2.98	0.90
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	04.5	55.0	3.23	0.90	05.	53.0	2.94	0.80

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix E)

In Table 4.15 both the graduates and employers felt the highest performance was needed for the write computer operator instructions task, in the documentation group. Employers rated the task summarize calculations used in program as needing the lowest performance by entry level programmers. The graduates ranked it 4.5 out of 5 equal with summarize the controls in program to detect errors.

TABLE 4.16

RANKING OF MISCELLANEOUS TASKS PERFORMED IN TERMS OF
PROFICIENCY NEEDED BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
6.00	MISCELLANEOUS								
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	01.	07.0	3.90	0.97	01.	06.5	3.53	0.99
6.03	PERFORM PROGRAM MAINTENANCE.	02.	17.5	3.72	0.83	02.	14.0	3.41	0.77
6.02	PATCH COMPUTER PROGRAMS.	03.	36.0	3.50	1.07	04.	31.0	3.22	1.00
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	04.5	39.5	3.45	1.25	05.	34.5	3.17	1.25
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	04.5	39.5	3.45	1.00	06.5	36.5	3.14	0.96
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	06.	43.0	3.39	1.01	06.5	36.5	3.14	1.04
6.01	KEYPUNCH PROGRAM	07.	49.0	3.31	1.14	03.	29.0	3.25	1.05
6.07	USE VIRTUAL STORAGE TECHNIQUES	08.	63.5	3.16	1.23	08.	60.0	2.84	1.07
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE.	09.	72.0	2.75	1.07	09.	67.0	2.61	1.06
6.10	PREPARE PRINTER CARRIAGE TAPE.	10.	73.0	2.74	1.20	10.	72.5	2.53	0.99

*Mean: 1 = Very Low 2 = Low 3 = Average 4 = High 5 = Very High (See Appendix B)

Table 4.16 indicates within the ten tasks in the miscellaneous group, use job control language needed the highest performance in the opinion of both graduates and employers. This task also ranked very high in the entire list (75 items), with employers ranking it 6.5 and graduates ranking it 7th. The two tasks rated lowest in performance for miscellaneous group were prepare printer carriage tape rating 10th and convert a program to another language rating 9th by both graduates and employers. These two tasks also rated very low on the performance scale for the entire list of task items. Prepare a printer carriage tape was ranked 73rd by graduates and 72.5 by employers, and convert a program to another language was ranked 72nd by graduates and 67 by employers.

Tables 4.17 through 4.22 deal with how important the task is for an entry level programmer over a range from being slightly important to being critical for entry level employment.

TABLE 4.17
RANKING OF TASKS PERFORMED IN SYSTEMS ANALYSIS AND DESIGN IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
1.00	SYSTEMS ANALYSIS AND DESIGN								
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	01.	12.0	3.78	0.86	01.5	13.5	3.68	0.91
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	02.	25.0	3.62	0.98	01.5	13.5	3.68	0.98
1.03	WORK WITH USERS ON PROBLEM	03.	31.0	3.50	1.07	08.	52.0	3.08	1.18
1.10	PREPARE A DISK RECORD LAYOUT	04.	35.0	3.46	1.03	03.	18.0	3.58	0.95
1.08	PREPARE A PRINTER SPACING FORM	05.	40.0	3.37	0.97	05.5	36.0	3.34	0.91
1.01	USE COMPANY SYSTEM STANDARDS	06.	43.0	3.27	1.09	04.	27.5	3.41	1.06
1.09	PREPARE A TAPE RECORD LAYOUT	07.	46.5	3.18	1.04	05.5	36.0	3.34	1.06
1.07	PREPARE A CARD RECORD LAYOUT	08.	55.0	3.11	1.06	07.	49.5	3.11	1.20
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM.	09.	62.0	2.99	1.12	09.5	56.0	3.04	0.97
1.06	PREPARE A SYSTEM FLOWCHART	10.	63.0	2.94	1.05	09.5	56.0	3.04	1.08
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	11.	75.0	1.73	1.05	11.	75.0	1.96	1.14

*Mean: 1 = Slight 2 = Some 3 = Important 4 = Very 5 = Critical (See Appendix E)

Table 4.17 shows that in the system analysis and design group of eleven tasks the graduates indicated the task, working with other programmers on problems, was the most important. The employers felt that two tasks, working with other programmers on a problem and working with systems analysts on a problem, were both ranked equally as the most important in the group. Graduates and employers placed the task, prepare a paper tape record layout, at the bottom of the group and the entire list of 75 tasks.

TABLE 4.18

RANKING OF TASKS PERFORMED IN PROGRAM DESIGN IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
2.00	PROGRAM DESIGN								
2.08	PREPARE A TEST DATA FOR PROGRAMS	01.	11.0	3.85	1.01	01.	09.0	3.87	1.02
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	02.	23.0	3.63	0.96	07.	46.0	3.21	1.13
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES.	03.	39.0	3.39	1.02	04.	32.0	3.38	1.20
2.10	SELECT FILE ORGANIZATION AND ACCESS METHODS FOR DATA FILES	04.	41.0	3.36	1.06	03.	26.0	3.42	1.04
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART.	05.	42.0	3.32	1.10	02.	24.5	3.46	0.94
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM.	06.	48.0	3.17	1.25	09.	64.5	2.74	1.22
2.01	USE STANDARD FLOWCHART SYMBOLS	07.	50.5	3.15	1.10	06.	44.5	3.22	1.04
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	08.5	57.5	3.09	1.13	05.	36.0	3.34	1.04
2.06	DIVIDE A PROGRAM INTO MODULES.	08.5	57.5	3.09	1.11	08.	47.0	3.19	1.07
2.05	PREPARE A DECISION TABLE	10.	71.0	2.40	0.96	10.	69.0	2.36	0.98
2.04	PREPARE A GRID CHART	11.	74.0	1.77	0.78	11.	74.0	2.12	0.87

*Mean: 1 = Slight 2 = Some 3 = Important 4 = Very 5 = Critical (See Appendix E)

In Table 4.18 we see both graduates and employers selecting the task, prepare test data for programs, as the most important one in the program design group of eleven tasks. Both graduates and employers rated the same two tasks as having minor importance. Prepare a grid chart received a rating of 11th by both groups and prepare a decision table received a rating of 10th. These two also were rated very low in the entire group of 75 tasks. Both groups rated prepare a grid chart as 74th in the item list. Prepare a decision table was rated 71st by graduates and 69th by employers.

TABLE 4.19

RANKING OF TASKS PERFORMED IN CODING IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
3.00	CODING								
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	01.	07.0	4.02	0.95	02.	08.0	3.88	1.07
3.26	USE CODING SHEETS.	02.	08.0	3.97	1.11	01.	07.0	3.90	1.03
3.20	WRITE COMMENTS IN PROGRAM.	03.	14.0	3.76	1.07	03.	10.0	3.82	1.02
3.22	WRITE EDIT ROUTINES.	04.5	15.5	3.75	0.91	04.	15.5	3.63	0.81
3.16	WRITE ERROR ROUTINES	04.5	15.5	3.75	0.97	05.	19.0	3.56	0.75
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	06.	18.5	3.70	0.87	07.	22.5	3.47	0.97
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	07.	21.0	3.65	0.89	06.	21.0	3.50	0.89
3.17	USE LIBRARY ROUTINES	08.5	26.5	3.61	1.09	09.5	29.5	3.39	0.99
3.12	USE TAPE FILE HANDLING ROUTINES.	08.5	26.5	3.61	1.04	12.	34.0	3.37	0.83
3.05	USE DISK SORT UTILITY ROUTINES	10.	28.0	3.59	1.02	09.5	29.5	3.39	0.90
3.15	WRITE SUBROUTINES.	11.	29.0	3.58	1.00	11.	32.0	3.38	0.88
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	12.	31.0	3.50	0.97	15.5	42.5	3.23	0.98
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS.	13.	33.0	3.48	1.09	15.5	42.5	3.23	1.01
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	14.	34.0	3.47	0.98	08.	27.5	3.41	0.84
3.13	USE CARD FILE HANDLING ROUTINES.	15.5	36.5	3.43	1.02	14.	41.0	3.25	0.97
3.14	USE DATA COMMUNICATIONS ROUTINES	15.5	36.5	3.43	1.07	17.5	52.0	3.08	1.11
3.06	WRITE TABLE BUILDING INSTRUCTIONS.	17.	38.0	3.42	0.97	13.	38.0	3.32	0.91
3.04	USE TAPE SORT UTILITY ROUTINES	18.	50.5	3.15	1.16	19.	56.	3.04	0.97
3.19	USE MACROS	19.	60.0	3.07	1.08	17.5	52.0	3.08	1.19
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS.	20.	61.0	3.01	1.18	23.	66.0	2.69	1.43
3.08	WRITE TABLE SORTING INSTRUCTIONS	21.	64.0	2.91	1.07	21.	63.0	2.79	0.96
3.18	WRITE LIBRARY ROUTINES	22.	65.0	2.89	1.06	22.	64.5	2.74	1.03
3.23	WRITE CHECK DIGIT CHECKING ROUTINES.	23.	66.0	2.87	1.10	25.	68.0	2.54	0.94
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	24.	67.0	2.84	1.35	20.	59.0	2.98	1.35
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	25.	68.0	2.83	1.13	24.	67.0	2.60	1.07
3.25	WRITE FORM TEST PATTERN ROUTINES	26.	69.0	2.64	0.99	26.	70.5	2.31	1.06

*Mean: 1 = Slight 2 = Some 3 = Important 4 = Very 5 = Critical (See Appendix E)

Table 4.19 indicates that among the twenty-six tasks within the coding group write higher level language instructions was the most important task in the opinion of the graduates. Employers rated use coding sheets as the most important task. These two tasks rated very high in the entire task list with the graduates and employers both ranking them 7th and 8th. Both graduates and employers ranked write form test pattern routines as the least important task in the group.

TABLE 4.20
RANKING OF TASKS PERFORMED IN TESTING AND DEBUGGING IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
4.00	TESTING AND DEBUGGING								
4.04	CORRECT LOGICAL ERRORS	01.	01.0	4.40	0.79	03.	03.0	4.22	0.77
4.01	READ A PROGRAM LISTING	02.	02.0	4.37	0.79	01.	01.0	4.30	0.78
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	03.	03.0	4.16	0.90	04.	04.0	4.10	0.92
4.02	DESK CHECK A PROGRAM	04.	04.0	4.15	0.92	02.	02.0	4.23	0.81
4.09	TEST PROGRAM USING TEST DATA	05.	06.0	4.07	0.83	05.	05.0	4.05	0.91
4.10	TEST PROGRAM USING LIVE (USER) DATA	06.	09.0	3.95	0.97	06.	06.0	3.95	1.04
4.07	READ A FILE DUMP	07.	17.0	3.74	0.95	07.	15.5	3.63	0.94
4.08	READ A CROSS-REFERENCE LISTING	08.	18.5	3.70	1.03	08.	22.5	3.47	0.99
4.06	READ A MEMORY DUMP	09.	23.0	3.63	1.11	09.	32.0	3.38	1.06
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	10.	44.0	3.24	1.02	10.	44.5	3.22	0.98
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	11.	52.0	3.14	1.11	12.	61.0	2.95	1.12
4.05	READ A TRACE	12.	55.0	3.11	1.09	11.	49.5	3.11	1.03

*Mean: 1 - Slight 2 - Some 3 - Important 4 - Very 5 - Critical (See Appendix E)

Table 4.20 indicates that all of the tasks in the testing and debugging were important to the beginning programmer. According to the graduates all of the tasks had an average value of over three of a possible five. The employers rated all above three except one at 2.95. The graduates rated correcting logical errors as the most important in the group and the entire task list. Employers picked reading a program listing as the most important in the group and the entire task list. Reading a trace was the least important task in the group according to the graduates with the employers rating edit program for effective use of auxiliary storage as the least important.

TABLE 4.21
RANKING OF TASKS PERFORMED IN DOCUMENTATION IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
5.00	DOCUMENTATION								
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	01.	13.0	3.77	0.96	01.	17.0	3.61	1.01
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	02.	23.0	3.63	0.96	02.	20.0	3.54	0.94
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	03.	31.0	3.50	1.17	03.	24.5	3.46	0.92
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	04.	46.5	3.18	1.09	04.	39.0	3.29	0.95
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	05.	55.0	3.11	1.05	05.	40.0	3.26	0.91

*Mean: 1 = Slight 2 = Some 3 = Important 4 = Very 5 = Critical (See Appendix E)

Table 4.21 depicts both graduates and employers rating each item in the documentation group the same. The most important task was in the group, write computer operator instructions, and the least important was summarize calculations used in program. All five tasks had an average value of over three which indicates they were all important to a beginning programmer.

TABLE 4.22
RANKING OF MISCELLANEOUS TASKS PERFORMED IN TERMS OF
MASTERY OF THE TASK BY ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
6.00	MISCELLANEOUS								
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	01.	05.0	4.10	0.93	01.	11.0	3.78	1.06
6.03	PERFORM PROGRAM MAINTENANCE.	02.	10.0	3.92	0.87	02.	12.0	3.75	0.90
6.02	PATCH COMPUTER PROGRAMS.	03.	20.0	3.67	1.13	03.	48.0	3.13	1.15
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	04.	45.0	3.23	1.15	05.	58.0	3.00	1.08
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	05.	49.0	3.16	1.22	04.	54.0	3.07	1.16
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	06.	53.0	3.13	1.25	07.	62.0	2.88	1.19
6.07	USE VIRTUAL STORAGE TECHNIQUES	07.	59.0	3.08	1.22	06.	60.0	2.96	0.98
6.01	KEYPUNCH PROGRAM	08.	70.0	2.48	1.03	10.	73.0	2.21	0.95
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE.	09.	72.0	2.37	1.07	08.	70.5	2.31	0.96
6.10	PREPARE PRINTER CARRIAGE TAPE.	10.	73.0	2.20	0.95	09.	72.0	2.25	0.85

*Mean: 1 = Slight 2 = Some 3 = Important 4 = Very 5 = Critical (See Appendix B)

Table 4.22 indicates that among the ten tasks within the miscellaneous group, use job control language was the most important task in the opinion of both graduates and employers. This task also ranked very high in the entire task list (75 items), with graduates ranking it 5th and employers ranking it 11th. Performing program maintenance and patch computer programs were also rated as being very important by both employers and graduates. Prepare printer carriage tape was rated the least important in the miscellaneous group by graduates and ranked 9th in the group by employers. In the entire task list this task was rated 73rd by graduates and 72nd by employers. Two other tasks which were rated very low by both groups were: keypunch program and convert a program to another language.

Tables 4.23 through 4.28 deal with the future need (5 years) of the task over a range from greatly decrease, remain the same, to greatly increase the need for the task.

TABLE 4.23

RANKING OF TASKS PERFORMED IN SYSTEMS ANALYSIS AND DESIGN IN TERMS OF FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
1.00	SYSTEMS ANALYSIS AND DESIGN								
1.03	WORK WITH USERS ON PROBLEM	01.	11.5	3.77	0.94	04.	19.0	3.56	1.04
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	02.	14.0	3.71	0.86	03.	13.0	3.64	0.73
1.01	USE COMPANY SYSTEM STANDARDS	03.	20.0	3.67	1.03	01.	09.0	3.69	1.11
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	04.	26.0	3.57	0.96	02.	10.5	3.68	0.91
1.10	PREPARE A DISK RECORD LAYOUT	05.	37.0	3.48	0.90	05.	28.5	3.47	1.05
1.08	PREPARE A PRINTER SPACING FORM	06.	42.0	3.35	0.75	06.	41.0	3.28	0.95
1.06	PREPARE A SYSTEM FLOWCHART	07.	44.5	3.33	0.99	08.	46.0	3.14	1.06
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM.	08.	49.0	3.30	1.07	07.	43.0	3.22	1.26
1.09	PREPARE A TAPE RECORD LAYOUT	09.	52.0	3.18	0.91	09.	55.0	2.99	1.06
1.07	PREPARE A CARD RECORD LAYOUT	10.	59.5	3.02	0.98	10.	60.0	2.87	1.03
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	11.	75.0	1.77	1.03	11.	75.0	1.87	1.10

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

Table 4.23 shows that in the system analysis and design group of eleven tasks the graduate indicated two tasks, work with users on problem and work with other programmers on problem, would increase in need in the next five years. Employers felt the task most likely to increase in need was use company standards. Both graduates and employers thought that the need for preparing a paper tape record layout would decrease in the future. They also rated it 75th in the entire item list of 75 items.

TABLE 4.24

RANKING OF TASKS PERFORMED IN PROGRAM DESIGN IN TERMS OF
FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
2.00	PROGRAM DESIGN								
2.08	PREPARE A TEST DATA FOR PROGRAMS	01.5	08.5	3.79	0.93	01.	02.0	3.81	0.86
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES.	01.5	08.5	3.79	1.09	02.	08.0	3.71	1.13
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	03.	33.5	3.51	0.85	03.	24.0	3.49	0.86
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART.	04.	39.0	3.45	1.00	06.	44.0	3.21	0.94
2.10	SELECT FILE ORGANIZATION AND ACCESS METHODS FOR DATA FILES	05.	44.5	3.33	1.00	04.	30.0	3.40	1.03
2.06	DIVIDE A PROGRAM INTO MODULES.	06.	47.5	3.31	1.23	05.	36.0	3.34	1.11
2.01	USE STANDARD FLOWCHART SYMBOLS	07.	50.0	3.28	0.93	07.	50.0	3.08	0.92
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	08.	54.0	3.13	1.07	08.	53.5	3.01	1.02
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM.	09.	67.0	2.75	1.23	09.	63.0	2.76	1.10
2.05	PREPARE A DECISION TABLE	10.	71.0	2.52	1.05	10.	68.0	2.64	1.03
2.04	PREPARE A GRID CHART	11.	74.0	2.04	0.95	11.	74.0	2.32	0.99

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

Table 4.24 shows the graduates indicating two tasks, prepare test data for programs and use structured programming techniques, as having the greatest future need in the program design group of eleven items. They also rated these two very high on the entire list with a rank of 8.5. The employers also ranked prepare test data for program as number one in the group and number two in the entire list of 75 items. They also rated use structured programming techniques as 2nd in the group and 8th in the entire list. Prepare a grid chart was ranked last in the group and second to last in the entire list by both graduates and employers.

TABLE 4.25

RANKING OF TASKS PERFORMED IN CODING IN TERMS OF
FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
3.00	CODING								
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	01.	07.0	3.80	1.00	02.	03.5	3.79	0.94
3.20	WRITE COMMENTS IN PROGRAM.	02.	10.0	3.78	0.96	03.	10.5	3.68	0.82
3.14	USE DATA COMMUNICATIONS ROUTINES	03.	15.0	3.70	1.11	01.	01.0	3.83	0.91
3.22	WRITE EDIT ROUTINES.	04.5	17.0	3.69	0.96	05.	22.0	3.53	0.71
3.16	WRITE ERROR ROUTINES	04.5	17.0	3.69	0.88	06.	24.0	3.49	0.72
3.15	WRITE SUBROUTINES.	06.5	22.5	3.64	0.95	04.	19.0	3.56	0.87
3.17	USE LIBRARY ROUTINES	06.5	22.5	3.64	1.05	07.	26.5	3.48	0.89
3.05	USE DISK SORT UTILITY ROUTINES	08.	24.0	3.63	0.94	12.	35.0	3.35	0.80
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	09.	27.0	3.56	1.01	10.	33.0	3.37	0.83
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	10.5	30.0	3.54	1.03	08.5	31.5	3.39	0.81
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	10.5	30.0	3.54	0.98	15.	40.0	3.30	0.76
3.26	USE CODING SHEETS.	12.	33.5	3.51	0.97	13.5	38.0	3.32	0.83
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	13.5	37.0	3.48	0.89	08.5	31.5	3.39	0.69
3.06	WRITE TABLE BUILDING INSTRUCTIONS.	13.5	37.0	3.48	0.91	11.	34.0	3.36	0.68
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS.	15.	40.0	3.43	1.09	13.5	38.0	3.32	0.88
3.12	USE TAPE FILE HANDLING ROUTINES.	16.	41.0	3.36	1.08	18.	53.5	3.01	0.85
3.18	WRITE LIBRARY ROUTINES	17.	53.0	3.14	1.03	16.	47.0	3.13	1.01
3.19	USE MACROS	18.	56.0	3.09	1.11	17.	52.0	3.03	1.04
3.04	USE TAPE SORT UTILITY ROUTINES	19.	57.0	3.07	1.15	23.	64.5	2.74	1.02
3.13	USE CARD FILE HANDLING ROUTINES.	20.	59.5	3.02	1.06	22.	62.0	2.78	0.71
3.08	WRITE TABLE SORTING INSTRUCTIONS	21.	61.0	3.00	0.95	20.	58.0	2.92	0.90
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	22.	63.0	2.93	1.06	19.	56.0	2.97	1.10
3.23	WRITE CHECK DIGIT CHECKING ROUTINES.	23.	64.0	2.88	1.05	24.	67.0	2.67	0.94
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS.	24.	66.0	2.79	1.16	25.	69.0	2.62	1.23
3.25	WRITE FORM TEST PATTERN ROUTINES	25.	68.0	2.65	0.98	26.	70.0	2.57	1.01
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	26.	69.0	2.63	1.29	21.	59.0	2.89	1.19

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

Table 4.25 indicates that in the opinion of the graduates, write higher level language instructions, had the greatest future need. They also placed it high in the entire list with a rank of 7th. The employers felt that the task use data communications routines had the greatest future need in the group and the entire list of tasks. Employers thought write higher level language instructions also had a great future need ranking it 2nd in the group and 3.5 in the entire list (75 items). The task which the graduates felt had the least future need in the group was write report program generator language instructions with the employers picking write form test pattern routine as last.

TABLE 4.26

RANKING OF TASKS PERFORMED IN TESTING AND DEBUGGING IN TERMS OF
FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
4.00	<u>TESTING AND DEBUGGING</u>								
4.04	CORRECT LOGICAL ERRORS	01.	01.0	3.99	0.91	02.	05.0	3.77	0.84
4.01	READ A PROGRAM LISTING	02.	02.0	3.96	0.91	04.	07.0	3.74	0.86
4.02	DESK CHECK A PROGRAM	03.	03.0	3.93	0.88	01.	03.5	3.79	0.85
4.09	TEST PROGRAM USING TEST DATA	04.	04.5	3.89	0.86	03.	06.0	3.75	0.83
4.10	TEST PROGRAM USING LIVE (USER) DATA	05.	17.0	3.69	0.92	05.	13.0	3.64	0.91
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	06.	19.0	3.68	0.97	06.	19.0	3.56	0.91
4.07	READ A FILE DUMP	07.	25.0	3.62	0.89	08.	26.5	3.48	0.74
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	08.	28.0	3.55	0.93	07.	24.0	3.49	0.77
4.06	READ A MEMORY DUMP	09.	30.0	3.54	1.01	10.	45.0	3.18	0.97
4.08	READ A CROSS-REFERENCE LISTING	10.	32.0	3.53	0.91	09.	42.0	3.27	0.84
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	11.	47.5	3.31	1.07	11.	48.5	3.11	0.94
4.05	READ A TRACE	12.	55.0	3.10	1.00	12.	51.0	3.07	0.91

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

Table 4.25 shows that graduates and employers felt all the ~~tasks~~ in the testing and debugging group would have increased future need in the next five years. The graduates picked correct logical errors as the task having most future need both in the testing and debugging group and the entire task list. They also placed read a program listing and desk check a program very high in the group and the item list with a rank of two and three in both. The employers selected desk check a program as having the most future need in the group and placed it 3.5 in the entire list. Both graduates and employers placed read a trace at the bottom of the group for future need.

TABLE 4.27

RANKING OF TASKS PERFORMED IN DOCUMENTATION IN TERMS OF
FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	-----GRADUATE-----				-----EMPLOYER-----			
		GROUP RANK	ITEM RANK	MEAN	S D	GROUP RANK	ITEM RANK	MEAN	S D
5.00	<u>DOCUMENTATION</u>								
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	01.	06.0	3.84	0.87	03.	17.0	3.58	0.89
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	02.	13.0	3.75	0.90	02.	15.0	3.63	0.86
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	03.	21.0	3.66	0.99	01.	13.0	3.64	0.97
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	04.	43.0	3.34	1.03	04.	28.5	3.47	0.86
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	05.	51.0	3.22	0.97	05.	38.0	3.32	0.96

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

Table 4.27 points out that in the documentation group of five items, the task showing the greatest future need in the opinion of the graduates was write computer operator instructions. Employers rated prepare a program documentation manual as having the greatest future need in the group. Write computer operator instructions was also rated very high in the entire item list of 75 items. Both groups placed summarize calculations used in program last in the group for future need.

TABLE 4.28

RANKING OF MISCELLANEOUS TASKS PERFORMED IN TERMS OF
FUTURE NEED OF THE TASK FOR ENTRY LEVEL PROGRAMMERS

ITEM NO.	TASK DESCRIPTION	GRADUATE				EMPLOYER			
		GROUP RANK	ITEM RANK	MEAN*	S D	GROUP RANK	ITEM RANK	MEAN*	S D
6.00	MISCELLANEOUS								
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	01.	04.5	3.89	1.03	02.	21.0	3.55	0.98
6.03	PERFORM PROGRAM MAINTENANCE.	02.	11.5	3.77	0.87	01.	16.0	3.59	0.75
6.02	PAUSE COMPUTER PROGRAMS.	03.	35.0	3.50	1.11	04.	57.0	2.95	1.16
6.07	USE VIRTUAL STORAGE TECHNIQUES	04.	46.0	3.32	1.28	03.	48.5	3.11	1.26
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	05.	58.0	3.06	1.08	05.	61.0	2.84	0.95
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	06.	62.0	2.97	1.18	06.	64.5	2.74	0.99
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	07.	65.0	2.84	1.24	07.	66.0	2.69	0.98
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE.	08.	70.0	2.58	1.11	10.	73.0	2.42	1.12
6.01	KEYPUNCH PROGRAM	09.	72.0	2.41	1.00	09.	72.0	2.44	0.91
6.10	PREPARE PRINTER CARRIAGE TAPE.	10.	73.0	2.28	1.00	08.	71.0	2.48	0.97

*Mean: 1 = Very Low 2 = Low 3 = No Change 4 = High 5 = Very High (See Appendix E)

In table 4.28 the graduates selected use job control language in the miscellaneous group of ten items as having the greatest future need. The employers selected perform program maintenance as the first task in the list. Prepare printer carriage tape was chosen by the graduates as having the least future need in the miscellaneous group. The employers placed convert a program to another language at the end of the list. Both graduates and employers put prepare printer carriage tape very low in the entire list of 75 items giving it a rank of 73.

The respondents were asked to list under other tasks in the survey instrument any tasks that were not included. Refer to Appendixes K and L for a list of these tasks. Working with CRT's was the only task mentioned by several graduates.

Follow-Up Interviews

Twenty-six graduates and twenty-one employers were interviewed with the assistance of an interview guide (refer to Appendixes G and H) so that all questions were covered as equally as possible. The responses to the questions asked during the interview are summarized on the following pages. The first seventeen questions were the same for both groups and will be summarized together. The last two questions will be discussed separately for graduates and employers.

	Summary Graduate Response		Summary Employer Response	
1. What company standards are used by entry-level programmers?	None	= 3	None	= 2
	Standards Manual	= 8	Standards Manual	= 4
	Standard Forms	= 8	Standard Forms	= 2
	Documentation		Documentation	
	Standards	= 4	Standards	= 4
	Naming Conventions		Naming Conventions	
	For:		For:	
	Programs	= 4	Programs	= 5
	Files	= 5	Files	= 4
	Data	= 3	Data	= 3
	Follow Company		Criteria For Dates	= 1
	Standards Policy	= 4	Supervisor Check	
	Comments	= 2	Beginners and	
	Use Standard		Makes Suggestions	= 1
	Utilities			
	Suggestions	= 3		
	Have to Use			
	COBOL	= 1		
2. How do entry-level programmers interact with the following people in the company?	Never	= 5	Never	= 3
	Rarely	= 4	Rarely	= 6
	Manner:		Manner:	
U Formal &			Formal &	
S Informal	= Many		Informal	= Many
E Phone	= 3		Phone	= 1
R Meetings	= 4		Meetings	= 2
S Personal Visits	= 12		Personal Visits	= 6
	Discuss Test		Discuss Test	
	Results	= 1	Results	= 1

	Summary Graduate Response		Summary Employer Response	
2. (Continued)	Never	= 2	Never	= 2
	Informal		Informal	
A	Discussions	= 11	Discussions	= 11
N	Analyst Assigns		Analyst Assigns	
A	Work and Gives		Work	= 1
L	Directions	= 1	Programmer Work	
Y	Meetings	= 1	as Analyst	= 2
S	Analyst Provides		Work on Teams	= 1
T	General System			
	Design & Layout	= 1		
	Charts	= 8		
P				
R	Never	= 2	Never	= 4
O M	Informal		Informal	
G E	Interchange	= 13	Interchange	= 11
R R	Project Teams	= 2	Project Teams	= 2
A S	Courses	= 1	Formal Meetings	= 1
M				
-				
3. Are there visual display units (CRT's) in any part of the environment? If yes, what are special skills needed in working on this VDU (CRT)?	Yes	= 10	Yes	= 9
	No	= 16	No	= 12
	Be able to read manual		Learn CICS--know concepts	= 1
			Screen Formatting	= 1
			Data Communications Knowledge	= 1
4. Are beginning programmers required to use structured programming?	Yes	= 6	Yes	= 2
	No	= 18	No	= 19
If yes, what is done in structured programming?	Top-Bottom Flow	= 1	Top-Down Concept	= 1
	Minimal Use of Go To Shells	= 1	Minimal Use of Go To Condense Main Line	= 1
	Book Format Documentation (Chapters)	= 1	Programs Follow Same Basic Pattern Structure	= 1

	Summary Graduate Response		Summary Employer Response	
4. Continued				
<u>If no</u> , do you think structured programming will be required in the foreseeable future?	Yes = 5		Yes = 4	
	No = 13		No = 15	
5. What file organization and access methods are used?	Consecutive = 11		Consecutive = 8	
	Sequential = 25		Sequential = 20	
	Index Sequential = 22		Index Sequential = 15	
	Random (Direct) = 19		Random (Direct) = 18	
	Virtual = 1		Virtual = 2	
	Others:		Others:	
	Batch Files = 1		PTS (NCR) = 1	
	Chain Files = 1		Total = 1	
			Will Replace ISAM = 1	
6. Do entry-level programmers work with outside software?	Yes = 13		Yes = 5	
	No = 13		No = 16	
<u>If yes</u> , what skills needed?	Minor = 1		Understanding = 1	
What types of modifications, etc., are done?	Updates provided = 1		Very limited = 1	
	Modify package for user application = 1			
7. Are data-base packages used?	Yes = 5		Yes = 6	
	No = 21		No = 15	
<u>If yes</u> , which one?	IMS = 1		IMS & IDMS = 1	
	Forte (Burroughs) = 1		Forte (Burroughs) = 1	
8. What kinds of edits are entry level programmers required to use?	Test for:		Follows Program	
	Numeric, alpha-betic, duplicate record, positive, negative, validity, zero = 1		Definition = 1	

	Summary Graduate Response	Summary Employer Response
8. Continued	Totals: Batch & Others Valid Codes Limit Checks, Range Check, Required Fields, Check Digit, Cross Checking Files, Error Conditions, Date, Audit Trails, Valid Printer Characters = 1	
9. How do beginning programmers do printer align- ment in programs?	Line Counts = Many Standard Carriage Tape = Many Dummy Forms = 1	Line Counts = Many Standard Carriage Tape = Many Operator Instructions = 1
10. Do entry-level programmers provide restart points in their programs?	Yes = 18 No = 8	Yes = 7 No = 14
<u>If yes, how?</u>	Control Cards = 1 Specific Key (Field) = 1	Control Cards = 1 Key Record = 1
11. Do entry-level programmers use application or detailed line- handling routines for data communi- cations equipment?	Application = 7 Detailed Line-Handling = 2 No = 17	Application = 3 Detailed Line-Handling = 2 No = 15
12. What techniques do entry-level programmers use in desk checking?	80-80 List Check Check Cards Manually Step Through Program Trace and Core Dump Cross Reference Listing Check with Other Programmers	Boss Check Code Check Off List Check Programs With Known Results

	Summary Graduate Response	Summary Employer Response
13. What are the most common syntax and logic errors made by entry-level programmers?	Spelling Errors Punctuation Keypunch Errors Forgot to Define Field Missing Instruction Loops Missing Periods (COBOL)	Field Length
14. What is the policy or practice on nested if's?	Not Permitted = 17 Very Limited = 6 Use Them = 3	Not Permitted = 13 Very Limited = 3
15. What are entry-level programmers required to do in the way of documentation?	Operator Instruction Sheets Flowcharts Many Comments Sample Printed Report Specification Sheets Definitions (Program, File, etc.) Error Message Sheet Layouts (Printer, File, etc.) Source Listing	Operator Instruction Sheets Flowcharts Many Comments Sample Printed Report Specification Sheets Definitions (Program, File, etc.) Layouts (Printer, File, etc.) Source Listing User Instructions
How is documentation organized?	Folders 3-Ring Binders Manual Book of Layouts	Folders 3-Ring Binders Manual Bound Listings Job Documentation Package

	Summary Graduate Response	Summary Employer Response
16. What problems do entry-level programmers encounter in program maintenance that differs from when they are developing a program?	Follow Other Programmers LOGIC = 18 Forecasting Future Needs Not Having The Most Recent Listing	Follow Other Programmers LOGIC= 12 Looking at Entire Program For Ramifications
17. What are the major applications that entry-level programmers write programs for?	Accounts Receivable = 10 Accounts Payable = 7 Inventory = 13 Payroll = 7 Sales-Commission = 5 Accounting = 6 Banking Miscellaneous	Accounts Receivable = 12 Accounts Payable = 7 Inventory = 6 Payroll = 7 Sales-Commission = 3 Accounting = 9 Banking Miscellaneous

The graduates were asked the question: What were the things, subjects, experiences, etc., from your two years in school that benefitted you the most? In their opinion the graduates felt the following had been the most beneficial:

Programming Courses and Skills	= 10	System Classes	= 2
Accounting Courses	= 6	Data Processing Club	= 2
Hands On	= 4	Different Languages	= 1
Communication Skills	= 3		

Graduates listed the following programming and other skills that were lacking when they started work:

Computer Operations	= 3	Work On Other People's Programs
None	= 2	Background on IBM Machines
Math		Background on Burroughs Machines
Debugging		Accounting
Applications		Teleprocessing
Documentation		

The employers were asked: What impressed you most about the graduates? The answers received were:

Well Rounded D.P. Education	= 5
Hard Workers	= 5
Good Accounting Background	= 3
Very Competitive	= 3
Could Write Programs Immediately	= 2
On-The-Job Training At School	
Good Documentation	
Logical Deduction Ability	

Employers listed the following as skills needed most by our graduates:

None	= 4
Experience (Programming and Operations)	
General Business Knowledge	
System Analysis and Design	
Structured Programming	
JCL	
Data Communications (On Line T.P.)	
School Should Update Equipment	

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

On the basis of the findings in chapter four, the following conclusions are drawn from the study:

1. Both graduates and employers tended to rank the four areas--frequency, performance, importance, and future need--the same for all six groups of tasks, especially at the high and low ends of the groups.
2. The following tasks were listed in the top fifteen in all four areas by both graduates and employers: Read a program listing, Desk check a program, Correct logical errors, Test program using test data, Write comments in program.
3. Six tasks that ranked in the last eight positions in the entire list of seventy-five items were: Prepare a paper tape record layout, Prepare a grid chart, Prepare a decision table, Prepare a printer carriage tape, Convert a program to another language, and Write form test pattern routines.
4. The interviews indicated that many businesses are using or are considering an on-line system in the near future.
5. It would appear, based on the results of both the mailed questionnaire and the personal interviews, that the Vocational, Technical and Adult Education system is currently emphasizing the proper tasks needed for entry-level programmers.

6. Many employers indicated that operations experience was very important to being a successful entry-level programmer (refer to Appendix J and Q).

Recommendations

Based on the study the author makes the following recommendations:

1. Due to the changing nature of data processing, studies of this nature should be conducted every five years.

2. Curriculum studies like Gateway Technical Institute, Kenosha, is conducting to determine the relevancy of the data processing curriculum presently being taught in VTAE schools in the State of Wisconsin should be stressed. The data collected in this study should be used as input to studies of the type being done at Gateway.

3. Technical Institutes training entry-level programmers in the survey's population area should review their course content using the results of this study as a guide to be sure that tasks high on the list are emphasized and tasks low on the list are dropped or de-emphasized.

4. VTAE districts conducting data processing programming programs should place considerable emphasis on the following entry-level programming skills:

- read a program listing
- desk check a program
- correct logical errors
- test program using test data
- write comments

5. VTAE districts conducting data processing programming programs should place high emphasis on the following entry-level program skills:

- work with other programmers on problem
- use company systems standards
- select appropriate data names for data
- use coding sheets
- correct syntax (clerical) errors
- use job control language
- write higher level language instructions

6. VTAE districts conducting data processing programming programs should minimize emphasis on the following entry-level programming skills:

- prepare a paper tape record layout
- prepare a grid chart
- prepare a decision table
- prepare a printer carriage tape
- convert a program to another language
- write form test pattern routines

7. VTAE districts conducting data processing programming programs should include a knowledge of on-line systems in their curriculum.

8. Data processing students should have some operating experience on their school's computer. This would help them better understand the operating system of the computer and operator run procedures.

9. Local advisory committees should be wisely used to determine the entry-level programming skills necessary to succeed as a programmer in a community. This could be done in the manner advisory committee members were used to assist in piloting this study.

10. Related research studies should be conducted in the data processing programmer entry-level skills area such as:

A study to determine the correlation between employees' and employers' opinions of necessary entry-level skills.

A study to determine if different entry programming skills are necessary to succeed in a large data processing installation vs. a small one.

A P P E N D I X

APPENDIX A

ORIGINAL TASK LIST

TASKS LIST

1.00 SYSTEMS ANALYSIS

- 1.01 Write a detailed description of a problem.
- 1.02 Communicate a problem with users.
- 1.03 Communicate a problem with a systems analyst.
- 1.04 Communicate a problem with users.
- 1.05 Prepare a system flowchart.
- 1.06 Prepare a card record layout.
- 1.07 Prepare a printer spacing form.
- 1.08 Prepare a tape record layout.
- 1.09 Prepare a disk record layout.
- 1.10 Prepare a paper tape record layout.
- 1.11 Other _____
- 1.12 Other _____
- 1.13 Other _____

2.00 PROGRAM DESIGN

- 2.01 Use all standard flowchart symbols.
- 2.02 Prepare a general (logic) program flowchart.
- 2.03 Prepare a detail program flowchart.
- 2.04 Prepare a grid chart.
- 2.05 Prepare a decision table.
- 2.06 Divide a program into modules (segmentation).
- 2.07 Use structured programming techniques.
- 2.08 Prepare test data for programs.
- 2.09 Select appropriate data names for data.
- 2.10 Select file organization and access methods for data files.

2.00 PROGRAM DESIGN (Continued)

2.11 Select appropriate programming language to be used for problem.

2.12 Other _____

2.13 Other _____

2.14 Other _____

3.00 CODING

3.01 Write machine language instructions.

3.02 Write assembler language instructions.

3.03 Write higher level language instructions.

3.04 Write report program generator language instructions.

3.05 Write input instructions.

3.06 Write output instructions.

3.07 Write data transfer instructions.

3.08 Write arithmetic instructions.

3.09 Write decision making instructions.

3.10 Write unconditional branch instructions.

3.11 Use tape sort utility routines.

3.12 Write tape sort routines.

3.13 Use disk sort utility routines.

3.14 Write disk sort routines.

3.15 Write table building instructions.

3.16 Write table searching instructions.

3.17 Write table sorting instructions.

3.18 Write sequential disk file handling routines.

3.19 Use index-sequential disk file handling routines.

3.20 Write index-sequential disk file handling routines.

3.21 Use random disk file handling routines.

3.22 Write random disk file handling routines.

3.00 CODING (Continued)

- 3.23 Use tape file handling routines.
- 3.24 Write tape file handling routines.
- 3.25 Use card file handling routines.
- 3.26 Write card file handling routines.
- 3.27 Write data communications instructions.
- 3.28 Write subroutines.
- 3.29 Write error routines.
- 3.30 Use library routines.
- 3.31 Write library routines.
- 3.32 Write address modification instructions.
- 3.33 Use macros.
- 3.34 Write macros.
- 3.35 Write comments in program.
- 3.36 Write instructions for internal controls.
- 3.37 Write instructions for external controls.
- 3.38 Write edit routines.
- 3.39 Write check digit checking routines.
- 3.40 Write check point-restart instructions.
- 3.41 Write form test pattern routines.
- 3.42 Use coding sheets.
- 3.43 Use efficient coding.
- 3.44 Other _____
- 3.45 Other _____
- 3.46 Other _____

4.00 TESTING AND DEBUGGING

- 4.01 Read a program listing.
- 4.02 Desk check a program.
- 4.03 Correct syntax (clerical) errors.
- 4.04 Correct logical errors.
- 4.05 Read a trace.
- 4.06 Read a snapshot dump.
- 4.07 Read a memory dump.
- 4.08 Read a file dump.
- 4.09 Read a cross-reference listing.
- 4.10 Test program using test data.
- 4.11 Test program using live (user) data.
- 4.12 Use cross reference listing.
- 4.13 Edit programs for effective use of primary storage.
- 4.14 Edit programs for effective use of secondary storage.
- 4.15 Edit programs for efficiency of compiler generated code.
- 4.16 Recommend corrections or modifications to programs.
- 4.17 Other _____
- 4.18 Other _____
- 4.19 Other _____

5.00 DOCUMENTATION

- 5.01 Prepare a program documentation manual.
- 5.02 Write computer operator instructions required to run program.
- 5.03 Write program updates after a revision.
- 5.04 Summarize the controls built into the program to detect errors.
- 5.05 Summarize calculations used in program.
- 5.06 Other _____

5.00 DOCUMENTATION (Continued)

5.07 Other _____

5.08 Other _____

6.00 AUXILIARY OR MISCELLANEOUS

6.01 Provide control cards for program.

6.02 Keypunch program.

6.03 Patch computer programs.

6.04 Perform program maintenance.

6.05 Convert a program to another language.

6.06 Operate computer for program tests.

6.07 Use job control language (JCL).

6.08 Use virtual storage techniques.

6.09 Use number systems.

6.10 Understand operating system.

6.11 Other _____

6.12 Other _____

6.13 Other _____

APPENDIX B



LETTER TO EMPLOYEE RECEIVING SURVEY INSTRUMENT

State of Wisconsin \ BOARD OF VOCATIONAL, TECHNICAL & ADULT EDUCATION

EUGENE LEHRMANN
State Director
4802 Sheboygan Avenue
MADISON, WISCONSIN 53702

February 16, 1976

Dear Graduate:

The Vocational, Technical and Adult Education System in Wisconsin is conducting a statewide research study aimed at identifying job tasks, performance levels, general education, and other learning experiences as they relate to data processing programmers. District One and Gateway Technical Institutes have been designated to conduct this study as a cooperative project. The results of this study will be used to revise and update the data processing program in an effort to prepare people better for the world of work.

As a graduate of an associate degree data processing program, your assistance would be of great value. We would greatly appreciate your taking about twenty minutes to complete the enclosed questionnaire and return it, together with the informational cover sheet, in the enclosed, self-addressed envelope. If your position does not involve programming, please answer only the questions on the informational cover sheet and return.

If you have any questions concerning the survey, please call Joseph N. Kettner, District One Technical Institute-Eau Claire, 715-836-3933.

In an effort to obtain an even better analysis of needed program changes, we would also like to receive input from your supervisor if he/she supervises people that do programming. With this in mind, would you please give the other questionnaire packet to your supervisor and ask that he/she complete and return it.

The results of this survey will be furnished to you upon your request.

Sincerely,

A handwritten signature in cursive script that reads "Eugene Lehrmann".

Eugene Lehrmann
State Director

EL:go

Enclosures

APPENDIX C

FOLLOW-UP LETTER TO EMPLOYEE RECEIVING SURVEY INSTRUMENT

DISTRICT ONE TECHNICAL INSTITUTE - EAU CLAIRE

620 WEST CLAIREMONT AVENUE
EAU CLAIRE, WISCONSIN 54701

March 3, 1976

Dear Graduate:

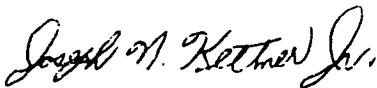
Approximately two weeks ago you were sent a questionnaire relating to a study being conducted by District One and Gateway Technical Institutes. At this time we have not yet received your response.

It is of vital importance to the reliability of this study that we receive a response from you. With this in mind, we have enclosed copies of a questionnaire for you as well as one for your employer to complete (see explanation on enclosed cover letters).

In the event that you have already returned the original questionnaire, please ignore this reminder. If you did not have an opportunity to complete the original questionnaire, please complete the one which is enclosed and return it by March 16, 1976.

I sincerely appreciate the time you have given to the completion of the questionnaire.

Sincerely,



Joseph N. Kettner, Jr.
Principal Research Investigator

sb

Enclosures

LETTER TO EMPLOYER RECEIVING SURVEY INSTRUMENT



State of Wisconsin \ BOARD OF VOCATIONAL, TECHNICAL & ADULT EDUCATION

EUGENE LEHRMANN
State Director
4802 Sheboygan Avenue
MADISON, WISCONSIN 53702

February 16, 1976

Dear Employer/Supervisor:

The Vocational, Technical and Adult Education System in Wisconsin is conducting a statewide research study aimed at identifying job tasks, performance levels, general education, and other learning experiences as they relate to data processing programmers. District One and Gateway Technical Institutes have been designated to conduct this study as a cooperative project. The results of this study will be used to revise and update the data processing program in an effort to prepare people better for the world of work.

As a supervisor of a graduate(s) of an associate degree data processing program, your assistance would be of great value. We would greatly appreciate your taking about twenty minutes in order to complete the attached questionnaire and return it, together with the informational cover sheet, in the enclosed, self-addressed envelope. We have asked one of our graduates who is employed under your supervision to seek your cooperation. This employee, through an interest in upgrading his/her occupation/profession, is also cooperating with us in this study.

If you have any questions concerning the survey, please call Joseph N. Kettner, District One Technical Institute-Eau Claire, 715-836-3933.

The results of this survey will be furnished to you upon your request.

Sincerely,

Eugene Lehrmann
Eugene Lehrmann
State Director

EL:go

Enclosures

APPENDIX E

INFORMATIONAL COVER SHEET FOR SURVEY INSTRUMENT

District One (Eau Claire) and Gateway (Kanosh) Technical Institutes

February, 1976

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DEFINITIONS FOR SURVEY RATINGS

Frequency

- 1=Never..... Not performed by entry level programmer.
- 2=< Monthly. Performed less than monthly (bi-monthly, quarterly, etc.) by entry level programmer.
- 3=Monthly... Performed monthly by entry level programmer.
- 4=Weekly.... Performed weekly by entry level programmer.
- 5=Daily..... Performed daily by entry level programmer.

Performance

- 1=Very Low.. Merely assists others in performing this task.
- 2=Low..... Performs task satisfactorily with constant supervision and some assistance.
- 3=Average... Performs this task satisfactorily with limited supervision.
- 4=High..... Performs this task satisfactorily without assistance or supervision.
- 5=Very High. Performs this task satisfactorily without assistance or supervision and can lead others in performing this task.

Importance

- 1=Slight.... Mastery of this task is only slightly important for entry level employment.
- 2=Some..... Mastery of this task is of some importance for entry level employment.
- 3=Important. Mastery of this task is important for entry level employment.
- 4=Very..... Mastery of this task is very important for entry level employment.
- 5=Critical.. Mastery of this task is critical for entry level employment.

Future Need

- 1=Very Low.. Need for task will decrease greatly during the next five years.
- 2=Low..... Need for task will decrease during the next five years.
- 3=No Change. Need for task will remain the same for the next five years.
- 4=High..... Need for task will increase during the next five years.
- 5=Very High. Need for task will increase greatly during the next five years.

Please check one: ☐ Employer/Supervisor ☐ Employee ☐ Not Employed In D.P.

Name _____ Title _____

Company Name _____

Address _____

City _____ State _____ Zip Code _____

Telephone Number: (Area Code) _____ - _____

Number of programmers in your installation _____

Number of years of programming experience you have _____

Would you be available for a follow-up interview? Yes ☐ No ☐

If you would like a summary of the study findings, place a check in the box. ☐

Your name will remain confidential.

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DIRECTIONS: Carefully read each task statement and respond as it would relate to any entry level programmer where you work. In making this response, circle a "1" (Never) under the FREQUENCY column if the task is not performed by entry level programmers and proceed to column (D) FUTURE NEED. If the task is performed by entry level programmers, please complete all four columns.

At the end of each group, list and rate any other tasks which are performed.

	A FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	B PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	C IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	D FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
1.00 SYSTEMS ANALYSIS AND DESIGN				
1.01 Use company system standards	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.02 Write a detailed description of a problem.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.03 Work with users on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.04 Work with systems analyst on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.05 Work with other programmers on problem	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.06 Prepare a system flowchart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.07 Prepare a card record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.08 Prepare a printer spacing form	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.09 Prepare a tape record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.10 Prepare a disk record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.11 Prepare a paper tape record layout	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.12 Other _____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.00 PROGRAM DESIGN				
2.01 Use standard flowchart symbols	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.02 Prepare a general (logic) program flowchart.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.03 Prepare a detail program flowchart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.04 Prepare a grid chart	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.05 Prepare a decision table	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.06 Divide a program into modules.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.07 Use structured programming techniques.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.08 Prepare a test data for programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

SURVEY INSTRUMENT

APPENDIX F

Y LEVEL PROGRAMMER TASK INVENTORY

PROGRAM DESIGN (Continued)

	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
Select appropriate data names for data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Select file organization & access methods for data files	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Select appropriate programming language for problem. .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other _____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

CODING

Write assembler language instructions.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write higher level language instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write report program generator language instructions .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use tape sort utility routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use disk sort utility routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write table building instructions.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write table searching instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write table sorting instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write sequential disk file handling routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use Index-sequential disk file handling routines . . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use random disk file handling routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use tape file handling routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use card file handling routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use data communications routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write subroutines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write error routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use library routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write library routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use macros	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write comments in program.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write instructions for internal/external controls. . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

LEVEL PROGRAMMER TASK INVENTORY

CODING (Continued)

	FREQUENCY	PERFORMANCE	IMPORTANCE	FUTURE NEED
	1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	1=Very Low 2=Low 3=Average 4=High 5=Very High	1=Slight 2=Some 3=Important 4=Very 5=Critical	1=Very Low 2=Low 3=No Change 4=High 5=Very High
Write edit routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write check digit checking routines.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write check point-restart instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write form test pattern routines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Use coding sheets.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other _____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

TESTING AND DEBUGGING

Read a program listing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Desk check a program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Correct syntax (clerical) errors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Correct logical errors	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Read a trace	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Read a memory dump	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Read a file dump	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Read a cross-reference listing	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Test program using test data	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Test program using live (user) data.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Edit program for effective use of auxiliary storage. .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Recommend corrections or modifications to programs . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other _____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

DOCUMENTATION

Prepare a program documentation manual	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write computer operator instructions	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write documentation updates after a program revision .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Summarize the controls in program to detect errors . .	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Summarize calculations used in program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other _____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

ENTRY LEVEL PROGRAMMER TASK INVENTORY

0 MISCELLANEOUS

- 1 Keypunch program
- 2 Patch computer programs
- 3 Perform program maintenance
- 4 Convert a program to another language
- 5 Operate computer for program tests
- 6 Use job control language (Control Cards)
- 7 Use virtual storage techniques
- 8 Perform number system arithmetic
- 9 Convert numbers between number systems
- 0 Prepare printer carriage tape
- Other _____

FREQUENCY	PERFORMANCE	IMPORTANCE	FUTURE NEED
1=Never	1=Very Low	1=Slight	1=Very Low
2=<Monthly	2=Low	2=Some	2=Low
3=Monthly	3=Average	3=Important	3=No Change
4=Weekly	4=High	4=Very	4=High
5=Daily	5=Very High	5=Critical	5=Very High

1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

I E : This section to be filled out by graduates only.

Indicate the amount of emphasis you feel should be given to the following areas of instruction:

EMPHASIS

- 1=Little or no emphasis
- 2=Less emphasis than now receiving
- 3=Same as present
- 4=More emphasis than now receiving
- 5=Of major importance--greater emphasis

GENERAL EDUCATION AND LEARNING EXPERIENCES

- Accounting
- American Institutions (Government)
- Communications Skills (English)
- State Competitive Data Processing Exams
- Economics
- Effective Speaking (Speech)
- Field Trips
- Student Data Processing Clubs
- Office Management
- Psychology of Human Relations
- Statistics

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

PLEASE RETURN TO:

Joseph N. Kettner, Jr.

District 1 Technical Inst.

620 West Clairemont Avenue

Eau Claire, WI 54701

VTAE District No. _____

APPENDIX G

GRADUATE INTERVIEW GUIDE

DISTRICT ONE TECHNICAL INSTITUTE
ENTRY LEVEL PROGRAMMER COMPETENCIES INTERVIEW GUIDE

NAME _____

COMPANY NAME _____

1. What company standards do you use in your job? (Ask for the 5 most important ones - examples)

_____ NONE

2. How do you interact with the following people in your company? (Give examples)

a. Users

b. Analysts

c. Other Programmers

3. Do you have any visual display units (CRT) in any part of your environment?

_____ YES _____ NO

If yes, what are some special programming skills that you need when working on the VDU (CRT)?

4. Are you required to or do you use structured programming? _____ YES _____ NO

If yes, would you briefly explain what you are doing in structured programming?

If no, do you think you will be required to use structured programming in the foreseeable future? _____ YES _____ NO

5. What file organization and access methods do you use in your shop?

_____ Consecutive (Unordered - No Key)

_____ Sequential

_____ Index Sequential

_____ Random (Direct)

_____ Virtual (Storage Access Method) (VSAM)

_____ Others

Indicate the one used most often.

6. Do you use outside software? ☐ YES ☐ NO

If yes, what skills do you need to use outside software?

What types of modifications, etc., are done?

7. Are you using any data-base package? ☐ YES ☐ NO

If yes, which one? _____

How involved? _____

8. What kind of edits are you doing? Give examples.

9. How do you do printer alignment in your programs?

10. Do you provide restart points in your programs? ☐ YES ☐ NO

If yes, how?

11. Do you use application or detailed line-handling routines for data communications equipment? Example - formatting on VDU (CRT)

12. What techniques do you use in desk checking?

13. What are the most common syntax and logic errors you make?

14. What is the policy or practice on nested if's?

15. What do you do in the way of documentation?

How is it organized?

16. What problems do you encounter in program maintenance that differ from when you are writing a program?

17. What are the major applications that you write programs for?

18. What were the things, subjects, experiences, etc., from your two years in school that benefited you the most?

19. What programming or other skills do you feel you were lacking when you first started work?

EMPLOYER INTERVIEW GUIDE

DISTRICT ONE TECHNICAL INSTITUTE
ENTRY LEVEL PROGRAMMER COMPETENCIES INTERVIEW GUIDE

NAME _____

COMPANY NAME _____

1. What company standards are used by entry level programmers? (Ask for the 5 most important ones - examples)

_____ NONE

2. How do entry level programmers interact with the following people in your company? (Give examples)

a. Users

b. Analysts

c. Other Programmers

3. Do you have any visual display units (CRT) in any part of your environment?

____ YES ____ NO

If yes, what are some special programming skills that an entry level programmer would need to use the VDU (CRT)?

4. Are your entry level programmers required to use structured programming?

____ YES ____ NO

If yes, would you briefly explain what they do in structured programming?

If no, do you think they will be required to use structured programming in the foreseeable future? YES NO

5. What file organization and access methods do you use in your shop?

- ____ Consecutive (Unordered - No Key)
- ____ Sequential
- ____ Index Sequential
- ____ Random (Direct)
- ____ Virtual (Storage Access Method) (VSAM)
- ____ Others

Indicate the one used most often.

6. Do entry level programmers work with outside software? ☐ YES ☐ NO

If yes, what skills do entry level programmers need to use outside software?

What types of modifications do they make?

7. Do entry level programmers use any data-base packages? ☐ YES ☐ NO

If yes, which one?

How involved?

8. What kind of edits are entry level programmers required to use? Give examples.

9. How do entry level programmers do printer alignment in their programs?

10. Do entry level programmers provide restart points in their programs?

☐ YES ☐ NO

If yes, how?

11. Do entry level programmers use application or detailed line-handling routines for data communications equipment? Example - formatting on VDU (CRT)

12. What techniques do entry level programmers use in desk checking?

13. What are the most common syntax and logic errors made by entry level programmers?

14. What is the policy or practice on nested if's?

15. What are entry level programmers required to do in the way of documentation?

How is it organized?

16. What problems do your entry level programmers encounter in program maintenance that differs from when they are writing a program?

17. What are the major applications that your entry level programmers write programs for?

18. What impressed you most about our graduates?

19. What skills are our graduates in need of most?

THANK YOU

3/15/76

SUMMARY OF GRADUATE ANSWERS TO INTERVIEW

DISTRICT ONE TECHNICAL INSTITUTE
ENTRY LEVEL PROGRAMMER COMPETENCIES INTERVIEW GUIDENAME 26 interviewed

COMPANY NAME _____

1. What company standards do you use in your job? (Ask for the 5 most important ones - examples)

Use Standards Manual (8) Naming Conventions for:Standard Forms (8) Programs (4), Files (5), and Data (3)Documentation Standards (4) Use Standard UtilitiesFollow Company Standards Policy (4) Suggestions (3)Comments (2) Have to Use COBOL3 NONE

2. How do you interact with the following people in your company? (Give examples)

- a. Users No = 5 Rarely = 4

Discussion (formal and informal) Personal Visit (12)Phone (3) Discuss Test ResultsMeetings (4)

- b. Analysts No = 3

Informal Frequent Discussions (11) Analyst Provides Gen. SystemMeetings Design & Layout Charts (8)Analyst Assigns Work and Gives Direction

- c. Other Programmers Rarely = 2

Mostly Informal Interchange (13)Project Teams (2)Courses

3. Do you have any visual display units (CRT) in any part of your environment?

10 YES 16 NO

If yes, what are some special programming skills that you need when working on the VDU (CRT)?

Be able to read manual.

4. Are you required to or do you use structured programming? 6 YES 18 NO

If yes, would you briefly explain what you are doing in structured programming?

Top-Bottom Flow

Minimal Use of Go To

Shells

Book Format Documentation (Chapters)

If no, do you think you will be required to use structured programming in the foreseeable future? 5 YES 13 NO

5. What file organization and access methods do you use in your shop?

11 Consecutive (Unordered - No Key)

25 Sequential

22 Index Sequential

19 Random (Direct)

1 Virtual (Storage Access Method) (VSAM)

X Others Batch File and Chain Files

Indicate the one used most often.

6. Do you use outside software? 13 YES 13 NO

If yes, what skills do you need to use outside software?

What types of modifications, etc., are done?

Minor

Updates Provided By Software House

Modify Package For User Application

7. Are you using any data-base package? 5 YES 21 NO

If yes, which one? IMS and FORTE (Burroughs)

How involved?

8. What kind of edits are you doing? Give examples.

Test for Numeric, Alphabetic, Duplicate Record, Positive, Negative,

Validity, Zero, Totals Batch and Others, Valid Codes, Limit Checks, Range

Checks, Required Fields, Check Digits, Cross Checking Files, Error

Conditions, Date, Audit Trails, Valid Printer Character

9. How do you do printer alignment in your programs?

Line Counts

Standard Carriage Tape

Dummy Forms

10. Do you provide restart points in your programs? 18 YES 8 NO

If yes, how?

Control Cards

Specify Key (Field)

7

2

11. Do you use application or detailed line-handling routines for data communications equipment? Example - formatting on VDU (CRT)
- No - 17
-
12. What techniques do you use in desk checking?
- 80-80 List Check Cross Reference Listing
- Check Cards Check With Other Programmers
- Manually Step Through Program
- Trace
- Core Dumps (Some)
13. What are the most common syntax and logic errors you make?
- Spelling Errors Loops
- Punctuation Missing Periods (COBOL)
- Keypunch Errors
- Forget To Define Field
- Missing Instruction
14. What is the policy or practice on nested if's?
- Do Not Use (17) :
- 6 said very limited
- 3 use
15. What do you do in the way of documentation?
- Operator Instruction Sheets (Run Manual) Specification Sheets
- Flowcharts Samples of Printed Report
- Error Message Sheet Program Definitions
- Many Comments

How is it organized?

Folders

3 Ring Binders

Manuals

Book of Layouts

16. What problems do you encounter in program maintenance that differ from when you are writing a program?

Following Other Programmers Logic (18)

Forecasting Future Needs

Not Having the Most Recent Program Listing

17. What are the major applications that you write programs for?

Accounts Receivable (10)

Sales-Commission (5)

Accounts Payable (7)

Accounting (6)

Inventory (13)

Banking

Payroll (7)

Miscellaneous

18. What were the things, subjects, experiences, etc., from your two years in school that benefited you the most?

Programming Courses and Skills (9)

Different Languages

Hands On (4)

Data Processing Club (2)

Accounting Courses (6)

System Classes (2)

Communication Skills (3)

19. What programming or other skills do you feel you were lacking when you first started work?

None (2)

Work On Other People's Programs

Computer Operations (3)

Background in IBM Machines

Math

Background in Burroughs Machines

Debugging

Accounting

Applications

Teleprocessing

Documentation

THANK YOU

3/15/76

SUMMARY OF EMPLOYER ANSWERS TO INTERVIEW

DISTRICT ONE TECHNICAL INSTITUTE
ENTRY LEVEL PROGRAMMER COMPETENCIES INTERVIEW GUIDENAME 21 interviewed

COMPANY NAME _____

1. What company standards are used by entry level programmers? (Ask for the 5 most important ones - examples)

Standards Manual (4) Criteria for Dates StandardStandard Forms (2) Supervisor Checks Beginner's ProgramsDocumentation Standards (4) and Makes SuggestionsNaming Conventions for:Programs (5), Files (4), Data (3)2 NONE

2. How do entry level programmers interact with the following people in your company? (Give examples)

- a. Users No = 3 Rarely = 6

Discussion (formal and informal) Personal Visits (6)Phone Discuss Test ResultsMeetings (2)

- b. Analysts No = 2

Informal Discussions (11) Analysts Assign WorkProgrammers Also Work as Analysts (2)Work on Teams

- c. Other Programmers Rarely = 4

Frequent Informal Interchange (11)Formal MeetingsWork on Teams (2)

3. Do you have any visual display units (CRT) in any part of your environment?

9 YES 12 NO

If yes, what are some special programming skills that an entry level programmer would need to use the VDU (CRT)?

Learn TICS - know Concepts

Screen Formatting

Data Communications Knowledge

4. Are your entry level programmers required to use structured programming?

2 YES 19 NO

If yes, would you briefly explain what they do in structured programming?

Top-Down Concept, Minimal Use of Go To, Condense Main Line

Programs Follow Same Basic Pattern Structure

If no, do you think they will be required to use structured programming in the foreseeable future? 4 YES 15 NO

5. What file organization and access methods do you use in your shop?

8 Consecutive (Unordered - No Key)

20 Sequential

15 Index Sequential

18 Random (Direct)

2 Virtual (Storage Access Method) (VSAM)

3 Others Total, PFS (NCR), Will Replace ISAM

Indicate the one used most often.

6. Do entry level programmers work with outside software? 5 YES 16 NO

If yes, what skills do entry level programmers need to use outside software?

What types of modifications do they make?

Very limited

7. Do entry level programmers use any data-base packages? 6 YES 15 NO

If yes, which one? IMS, IDMS, FORTE (Burroughs)

How involved? _____

8. What kind of edits are entry level programmers required to use? Give examples.

Follows program definition

9. How do entry level programmers do printer alignment in their programs?

Line Counts

Standard Carriage Tape

Operator Instructions

10. Do entry level programmers provide restart points in their programs?
7 YES 14 NO

If yes, how?

Key Record

Control Card

11. Do entry level programmers use application or detailed line-handling routines for data communications equipment? Example - formatting on VDU (CRT)

No = 15

12. What techniques do entry level programmers use in desk checking?

Boss Checks Code

Check Off List

Check Program Against Known Results

13. What are the most common syntax and logic errors made by entry level programmers?

Field Length

14. What is the policy or practice on nested if's?

No = 13

Very Limited = 3

15. What are entry level programmers required to do in the way of documentation?

Operator Instruction Sheets (13)

Source Listing

Definitions (Files, Programs)

Job Card Specifications

Flowcharts

Many Comments

Layouts (Printer, Files, Cards, etc.)

Sample Reports

User Instructions

How is it organized?

3 Ring Binders

Manuals

Folders (Documentation)

Bound Listings

Job Documentation Package

16. What problems do your entry level programmers encounter in program maintenance that differs from when they are writing a program?

Following Other Programmers Logic (12)

Looking at Entire Program for Ramification

17. What are the major applications that your entry level programmers write programs for?

Accounts Receivable (12)

Sales-Commission (3)

Accounts Payable (7)

Accounting (9)

Inventory (6)

Banking

Payroll (7)

Miscellaneous

18. What impressed you most about our graduates?

Well Rounded D. P. Education (5)

Good Accounting Background (3)

Could Write Programs Immediately (2)

On-the-Job Training at School

Hard Workers (5)

Good Documentation

Very Competitive (3)

Logical Deduction Ability

19. What skills are our graduates in need of most? None = 4

Experience (Programming and Operations)

JCL

General Business Knowledge

Data Communications (On Line T.P.)

Systems Analysis and Design

Structured Programming

School Should Update Equipment

THANK YOU

3/15/76

APPENDIX K

GRADUATE ANSWERS TO OTHER TASKS ON SURVEY INSTRUMENT

- 1.00 SYSTEMS ANALYSIS AND DESIGN:
 - Mag. ledger (MMR).
 - Knowledge of programming terms.
 - CRT layouts.
 - Graphics display layout.
 - Communicate effectively (informal talk, meetings, presentations).
 - Terminal screen layouts.
 - Prepare diskette layout.
 - Prepare operator run sheet.
 - Know limitations of languages.
 - Data record layout (Table Generation).
 - Teleprocessing.
 - Prepare memory storage layouts.
- 2.00 PROGRAM DESIGN:
 - When to use multi-languages.
 - Efficient core utilization.
 - Use various software packages.
- 3.00 CODING:
 - VSAM file handling.
 - Use data base software (IMS).
 - Use CRT for remote job entry.
 - Access the data base.
 - Write programs for CRT's.
- 4.00 TESTING AND DEBUGGING:
 - Data selection (Good Correlation).
 - Check results with user.
- 5.00 DOCUMENTATION:
 - Organize documentation.
 - Edit check documentation.
 - Technical report writing.
 - Write CRT operator instructions.
 - Record of data modifications.
 - Communicate with user via memos.
- 6.00 MISCELLANEOUS:
 - Wire boards (410, 510, 402).
 - Know full capabilities of your utilities.
 - Assist in operations.
 - Work overtime.

APPENDIX L

EMPLOYER ANSWERS TO OTHER TASKS ON SURVEY INSTRUMENT

- 1.00 SYSTEMS ANALYSIS AND DESIGN:
- Write a purpose and intent paragraph.
 - Prepare memory record layout.
 - Detailed description of system.
 - Read/understand a card, disk, tape layout.
 - Understanding of data base managers.
 - Interview user.
 - Prepare table layouts.
 - Give a design presentation to users and/or project team.
- 2.00 PROGRAM DESIGN:
- Description of design.
 - Make decision of structure vs. non-structure, modular vs. non-modular depending upon system requirements and available resources.
- 3.00 CODING:
- None.
- 4.00 TESTING AND DEBUGGING:
- Perform program modifications.
- 5.00 DOCUMENTATION:
- None.
- 6.00 MISCELLANEOUS:
- Boolean logic - switching functions.

APPENDIX M

GRADUATE SURVEY RESPONSES BY FREQUENCY COUNT

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DIRECTIONS: Carefully read each task statement and respond as it would relate to any entry level programmer where you work. In making this response, circle a "1" (Never) under the FREQUENCY column if the task is not performed by entry level programmers and proceed to column (D) FUTURE NEED. If the task is performed by entry level programmers, please complete all four columns.

At the end of each group, list and rate any other tasks which are performed.

	A FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	B PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	C IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	D FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
<u>1.00 SYSTEMS ANALYSIS AND DESIGN</u>	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.01 Use company system standards	9 11 13 15 78	3 7 70 35 10	9 16 52 30 19	7 5 41 49 29
1.02 Write a detailed description of a problem.	43 27 25 20 10	5 22 45 22 3	10 24 31 25 8	10 11 53 34 17
1.03 Work with users on problem	23 35 23 32 23	4 13 58 27 12	5 15 35 40 22	3 3 44 47 33
1.04 Work with systems analyst on problem	17 16 24 25 43	4 11 48 44 9	4 6 44 39 24	5 4 37 39 24
1.05 Work with other programmers on problem	3 12 15 39 66	0 7 46 56 21	0 8 43 51 30	2 2 37 45 28
1.06 Prepare a system flowchart	34 52 21 7 10	8 15 43 29 13	9 28 42 21 9	7 13 57 39 16
1.07 Prepare a card record layout	23 51 30 20 6	4 8 44 39 22	9 18 54 21 14	15 10 73 26 8
1.09 Prepare a printer spacing form	11 31 42 39 11	1 8 39 53 22	3 18 48 34 16	3 4 78 38 9
1.09 Prepare a tape record layout	44 34 27 19 5	3 7 39 28 15	6 14 43 19 12	8 10 63 32 8
1.10 Prepare a disk record layout	30 39 33 25 9	3 7 37 38 22	3 15 41 30 21	4 5 64 37 19
1.11 Prepare a paper tape record layout	121 9 2 1 0	19 3 10 4 1	24 7 6 2 1	68 14 27 4 2
1.12 Other _____	5 2 2 2 6	0 2 2 6 2	0 1 3 4 5	3 0 2 4 9
<u>2.00 PROGRAM DESIGN</u>				
2.01 Use standard flowchart symbols	11 28 39 32 17	3 7 39 59 19	10 26 44 35 15	6 9 74 26 16
2.02 Prepare a general (logic) program flowchart.	13 32 41 40 10	2 9 36 60 18	5 24 47 27 24	7 5 64 33 23
2.03 Prepare a detail program flowchart	34 42 34 17 10	3 7 40 46 15	9 27 39 25 15	13 12 64 26 15
2.04 Prepare a grid chart	109 18 5 1 0	10 12 17 2 1	20 18 7 1 0	47 20 46 3 0
2.05 Prepare a decision table	87 34 9 5 1	6 14 27 9 3	10 27 16 8 1	28 22 53 12 4
2.06 Divide a program into modules.	44 41 27 17 6	4 13 44 27 6	8 20 32 23 10	18 8 37 43 20
2.07 Use structured programming techniques.	38 16 29 20 41	4 6 45 37 14	4 14 45 28 18	8 3 37 48 40
2.08 Prepare a test data for programs	5 23 19 31 39	8 9 44 14 23	4 8 38 44 41	5 9 64 38 38

Y LEVEL PROGRAMMER TASK INVENTORY

LEVEL PROGRAMMER TASK INVENTORY					FREQUENCY					PERFORMANCE					IMPORTANCE					FUTURE NEED				
					1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily					1=Very Low 2=Low 3=Average 4=High 5=Very High					1=Slight 2=Some 3=Important 4=Very 5=Critical					1=Very Low 2=Low 3=No Change 4=High 5=Very High				
PROGRAM DESIGN (Continued)					1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Select appropriate data names for data					6	8	19	40	60	0	5	36	57	27	0	15	44	38	28	1	5	72	29	22
Select file organization & access methods for data files					40	30	27	27	12	6	11	43	25	9	5	15	29	34	13	9	8	55	39	14
Select appropriate programming language for problem. .					04	21	5	10	10	6	6	14	18	10	8	8	19	14	10	29	10	50	19	10
Other _____					1	0	1	2	1	0	1	1	1	0	0	1	1	1	0	0	0	2	2	1
CODING																								
Write assembler language instructions.					79	23	8	4	19	7	12	24	15	10	8	17	20	18	8	22	20	50	19	10
Write higher level language instructions					20	11	11	14	75	3	4	36	43	27	1	7	21	41	42	5	1	41	44	36
Write report program generator language instructions .					80	17	5	4	25	9	6	27	16	8	13	19	14	12	11	34	16	40	18	11
Use tape sort utility routines					60	19	25	17	12	5	7	30	11	10	8	25	21	18	13	17	8	61	18	16
Use disk sort utility routines					16	18	35	34	11	1	4	43	44	26	2	14	42	34	27	3	5	57	17	28
Write table building instructions.					10	11	4	6	27	2	8	43	55	6	4	13	53	36	19	4	6	62	38	19
Write table searching instructions					8	23	43	28	22	1	9	47	50	19	3	14	52	36	22	3	8	62	39	19
Write table sorting instructions					62	32	25	10	5	1	15	15	16	9	8	17	33	16	6	10	17	63	23	7
Write sequential disk file handling routines					12	14	42	27	39	2	1	43	56	21	2	4	47	47	24	7	3	56	42	21
Use index-sequential disk file handling routines . . .					20	28	13	28	25	2	7	50	17	18	2	4	48	39	22	7	4	52	40	25
Use random disk file handling routines					35	32	30	21	16	4	11	43	35	11	2	12	40	31	18	6	11	42	45	23
Use tape file handling routines.					30	12	32	25	34	3	5	36	44	19	4	9	17	11	25	8	10	57	24	21
Use card file handling routines.					11	30	30	30	33	2	5	39	54	25	3	19	46	35	22	11	25	57	21	11
Use data communications routines					55	27	10	16	15	3	17	28	19	11	2	13	28	18	16	7	6	35	37	31
Write subroutines.					34	19	26	35	20	1	11	32	40	17	2	12	25	34	21	6	6	48	46	25
Write error routines					10	12	30	45	36	1	1	42	54	21	2	8	42	61	33	2	2	59	39	29
Use library routines					27	20	21	32	34	3	6	42	39	20	4	13	33	33	28	7	5	44	42	29
Write library routines					75	28	15	11	5	5	11	32	34	8	5	23	24	12	6	11	13	57	30	11
Use macros					58	21	17	16	19	9	10	28	22	10	8	13	36	17	9	15	13	52	30	12
Write comments in program.					7	13	19	36	58	1	6	17	54	35	1	13	33	38	38	2	5	13	34	29
Write instructions for internal/external controls. . .					24	24	29	28	21	8	9	44	38	14	2	18	34	24	22	9	6	57	27	28

FILE PRODUCTION TASK LIST (CONT)

CODING (Continued)

	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Write edit routines.	8 18 46 34 20	1 8 41 53 22	2 3 45 45 20	4 2 57 36 32
Write check digit checking routines.	70 27 22 13 2	6 10 34 14 10	9 37 33 9 8	17 17 67 16 10
Write check point-restart instructions	70 27 17 8 3	9 14 23 14 7	10 23 29 9 7	16 17 50 23 9
Write form test pattern routines	77 27 19 12 2	6 11 22 20 1	8 18 26 5 3	20 20 61 11 4
Use coding sheets.	4 8 5 15 104	0 4 12 40 57	4 9 32 29 59	2 9 72 20 31
Other _____	1 0 2 1 3	0 1 1 1 3	1 0 0 3 2	0 0 2 2 3

TESTING AND DEBUGGING

	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Read a program listing	0 2 2 11 121	0 1 22 62 51	1 2 35 46 73	1 1 50 34 49
Desk check a program	0 4 8 35 89	1 6 25 44 37	3 4 18 53 57	1 1 68 40 44
Correct syntax (clerical) errors	1 2 14 27 92	0 1 25 59 49	2 2 28 43 60	2 5 64 26 37
Correct logical errors	0 4 13 37 82	0 1 34 62 38	1 0 30 38 77	1 1 48 33 51
Read a trace	42 43 27 12 9	4 15 42 27 10	7 23 36 22 13	12 11 67 26 11
Read a memory dump	22 23 30 42 18	6 18 41 31 18	5 13 32 37 30	6 7 55 38 26
Read a file dump	9 10 30 53 34	1 13 33 51 29	3 8 37 51 29	4 2 59 46 23
Read a cross-reference listing	16 11 21 38 48	3 5 30 46 36	3 13 31 44 30	4 5 63 39 22
Test program using test data	2 8 19 61 46	0 5 31 71 26	0 3 32 51 48	1 1 49 44 38
Test program using live (user) data.	5 13 41 42 35	2 3 45 61 22	3 4 37 43 47	3 2 61 37 32
Edit program for effective use of auxiliary storage.	53 37 21 10 13	3 15 41 14 11	6 20 29 22 11	9 13 54 28 19
Recommend corrections or modifications to programs	19 34 35 33 15	4 13 58 31 12	5 22 46 32 14	3 6 63 33 25
Other _____	1 0 1 1 1	0 0 1 7 1	0 0 0 2 1	0 0 1 2 1

DOCUMENTATION

	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily	PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High	IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical	FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Prepare a program documentation manual	37 34 37 14 14	6 11 45 34 10	8 12 31 32 25	5 5 48 44 29
Write computer operator instructions	13 33 38 30 22	1 12 44 49 18	8 12 40 38 36	1 3 51 44 36
Write documentation updates after a program revision	16 41 33 31 16	1 13 50 44 14	3 8 46 41 25	2 3 54 45 33
Summarize the controls in program to detect errors	48 30 34 9 14	2 12 51 17 10	3 24 34 17 15	6 14 59 37 21
Summarize calculations used in program	47 34 35 6 11	4 18 48 25 7	6 18 38 38 18	8 13 67 37 14
Other _____	5 9 1 1 1	0 1 8 2 8	0 0 1 1 1	0 0 2 2 1

LEVEL PROGRAMMER TASK INVENTORY

MISCELLANEOUS

Key punch program
 Patch computer programs.
 Perform program maintenance.
 Convert a program to another language.
 Operate computer for program tests
 Use job control language (Control Cards)
 Use virtual storage techniques
 Perform number system arithmetic
 Convert numbers between number systems
 Prepare printer carriage tape.
 Other _____

FREQUENCY	PERFORMANCE	IMPORTANCE	FUTURE NEED
1=Never	1=Very Low	1=Slight	1=Very Low
2=<Monthly	2=Low	2=Some	2=Low
3=Monthly	3=Average	3=Important	3=No Change
4=Weekly	4=High	4=Very	4=High
5=Daily	5=Very High	5=Critical	5=Very High
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
34 29 22 28 13	8 18 32 34 17	16 46 31 7 7	29 32 58 2 6
23 16 21 29 43	7 8 42 36 22	7 8 32 36 11	10 4 51 31 28
5 7 29 42 52	1 4 30 30 25	1 5 34 33 17	7 0 51 50 29
79 38 11 2 2	20 15 28 20 4	18 20 22 8 2	25 26 47 13 7
19 21 9 29 36	11 10 26 31 23	16 13 31 30 14	26 18 50 19 15
20 1 6 11 105	2 6 36 41 41	1 6 27 38 54	3 6 42 32 48
69 13 12 12 26	11 5 37 15 12	12 11 27 20 10	18 7 39 31 25
41 21 18 17 31	5 6 38 30 14	7 16 27 18 27	15 7 64 18 13
45 25 18 21 19	4 11 35 29 13	8 22 30 17 18	19 13 54 19 15
76 46 12 0 0	16 13 30 11 7	19 32 21 4 2	28 21 58 8 1
2 0 0 1 0	1 0 0 3 1	1 0 1 0 3	1 0 2 1 3

: This section to be filled out by graduates only.
 e the amount of emphasis you feel should be given
 following areas of instruction:

EMPHASIS

- 1=Little or no emphasis
- 2=Less emphasis than now receiving
- 3=Same as present
- 4=More emphasis than now receiving
- 5=Of major importance--greater emphasis

GENERAL EDUCATION AND LEARNING EXPERIENCES

Accounting
 American Institutions (Government)
 Communications Skills (English).
 State Competitive Data Processing Exams.
 Economics.
 Effective Speaking (Speech).
 Field Trips.
 Student Data Processing Clubs.
 Office Management.
 Psychology of Human Relations.
 Statistics

1 2 3 4 5
1 17 68 33 19
23 40 71 4 0
3 12 47 57 17
9 12 63 35 14
8 23 84 21 3
3 6 38 57 33
8 7 48 54 18
4 18 62 44 7
8 12 48 51 19
5 13 62 37 18
9 18 54 47 17

APPENDIX N

EMPLOYER SURVEY RESPONSES BY FREQUENCY COUNT

ENTRY LEVEL PROGRAMMER TASK INVENTORY

DIRECTIONS: Carefully read each task statement and respond as it would relate to any entry level programmer where you work. In making this response, circle a "1" (Never) under the FREQUENCY column if the task is not performed by entry level programmers and proceed to column (D) FUTURE NEED. If the task is performed by entry level programmers, please complete all four columns.

At the end of each group, list and rate any other tasks which are performed.

A FREQUENCY	B PERFORMANCE	C IMPORTANCE	D FUTURE NEED
1=Never	1=Very Low	1=Slight	1=Very Low
2=< Monthly	2=Low	2=Some	2=Low
3=Monthly	3=Average	3=Important	3=No Change
4=Weekly	4=High	4=Very	4=High
5=Daily	5=Very High	5=Critical	5=Very High

1.00 SYSTEMS ANALYSIS AND DESIGN

	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
1.01 Use company system standards	16 10 3 9 43	2 15 36 9 4	4 7 23 22 10	5 3 23 23 22
1.02 Write a detailed description of a problem.	18 18 13 8 4	4 13 27 2 1	3 8 24 8 4	12 6 26 21 13
1.03 Work with users on problem	18 19 17 15 12	8 14 31 8 3	6 17 16 18 8	4 3 25 19 18
1.04 Work with systems analyst on problem	7 7 5 23 39	4 24 35 16 7	2 5 25 28 17	1 2 29 28 15
1.05 Work with other programmers on problem	5 8 5 27 38	0 5 40 24 7	1 7 20 35 13	0 1 37 29 11
1.06 Prepare a system flowchart	21 27 8 8 7	5 3 33 9 2	4 13 18 13 5	7 9 34 18 8
1.07 Prepare a card record layout	20 26 11 18 8	2 6 30 19 6	7 13 20 15 9	11 9 39 13 4
1.08 Prepare a printer spacing form	12 17 18 24 10	1 8 31 25 5	1 10 31 20 8	5 3 43 16 9
1.09 Prepare a tape record layout	29 20 15 12 4	2 5 28 14 3	3 6 23 12 9	11 3 42 12 6
1.10 Prepare a disk record layout	17 21 18 17 8	2 8 32 20 3	2 4 26 22 12	5 2 36 17 15
1.11 Prepare a paper tape record layout	45 7 3 3 1	10 2 9 4 0	15 1 8 3 0	41 4 21 8 1
1.12 Other _____	5 3 1 1 4	0 2 6 0 2	0 2 2 2 3	4 0 4 5 3

2.00 PROGRAM DESIGN

	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.01 Use standard flowchart symbols	10 13 13 20 24	4 2 35 27 3	4 14 24 24 7	6 7 44 15 5
2.02 Prepare a general (logic) program flowchart.	10 18 18 21 13	2 10 34 22 2	2 8 26 27 9	6 4 41 20 6
2.03 Prepare a detail program flowchart	20 21 14 15 10	3 7 35 19 0	2 9 26 17 10	9 7 39 16 5
2.04 Prepare a grid chart	50 29 5 2 1	5 8 17 3 0	9 14 9 3 0	22 9 35 5 0
2.05 Prepare a decision table	42 21 10 6 1	6 10 24 4 0	9 17 11 7 0	15 10 24 12 1
2.06 Divide a program into modules.	27 14 13 18 7	8 8 34 8 4	8 7 29 14 7	8 3 31 23 11
2.07 Use structured programming techniques.	31 9 7 12 22	4 8 24 11 4	3 10 15 12 12	7 1 38 31 19
2.08 Prepare a test data for programs	1 8 14 34 18	8 8 41 18 18	1 6 20 21 17	8 1 25 30 12

LEVEL PROGRAMMER TASK INVENTORY

FREQUENCY	PERFORMANCE	IMPORTANCE	FUTURE NEED
1=Never	1=Very Low	1=Slight	1=Very Low
2=< Monthly	2=Low	2=Some	2=Low
3=Monthly	3=Average	3=Important	3=No Change
4=Weekly	4=High	4=Very	4=High
5=Daily	5=Very High	5=Critical	5=Very High
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

PROGRAM DESIGN (Continued)

Select appropriate data names for data	13 12 10 14 32	3 9 34 18 8	4 18 21 17 47	1 2 46 14 14
Select file organization & access methods for data files	29 23 4 14 9	6 14 19 10 6	2 9 16 20 8	5 3 37 17 13
Select appropriate programming language for problem.	36 9 5 4 3	6 4 9 7 3	6 7 10 5 3	16 3 29 5 8
Other _____	2 2 0 0 1	1 2 0 0 1	0 1 1 1 1	0 1 3 1 1

CODING

Write assembly language instructions.	45 17 4 3 11	9 8 17 9 2	11 13 9 3 9	20 9 30 9 6
Write high level language instructions	14 3 4 6 31	2 4 30 20 8	3 3 14 11 11	2 1 26 25 19
Write report program generator language instructions	39 20 5 3 14	5 9 21 8 4	7 13 12 6 10	13 8 35 8 9
Use tape sort utility routines	31 10 14 12 12	3 5 31 10 4	5 5 30 9 4	15 3 49 5 6
Use disk sort utility routines	5 8 18 23 27	0 7 42 17 10	2 5 41 17 11	2 0 53 11 10
Write table building instructions.	9 21 22 13 16	0 10 40 18 4	2 9 32 22 7	1 2 46 23 4
Write table searching instructions	8 16 25 15 17	0 8 42 18 5	1 7 33 25 7	1 1 46 23 5
Write table sorting instructions	31 23 15 6 4	2 14 26 9 2	5 15 20 12 1	9 4 46 12 2
Write sequential disk file handling routines	12 7 21 18 23	1 5 32 27 5	3 5 28 24 10	2 2 50 17 6
Use index-sequential disk file handling routines	11 14 18 15 22	2 11 30 21 6	2 5 27 28 8	1 5 43 17 9
Use random disk file handling routines	19 24 15 12 11	2 18 27 12 5	3 9 29 16 7	1 4 44 17 9
Use tape file handling routines.	17 6 19 22 17	1 4 32 22 6	2 4 32 22 8	7 4 51 13 3
Use card file handling routines.	13 12 15 18 23	1 4 38 24 4	5 6 32 22 6	6 12 52 7 0
Use data communications routines	34 23 9 3 10	9 13 21 4 2	4 10 18 10 8	1 4 19 30 18
Write subroutines.	15 17 18 17 14	1 14 32 15 4	2 7 24 26 8	3 34 28 10
Write error routines	9 3 24 24 13	1 5 43 20 3	1 3 27 25 8	1 1 39 27 6
Use library routines	10 9 17 17 28	0 8 37 16 7	2 9 30 19 11	1 3 40 20 12
Write library routines	38 26 9 4 7	6 16 15 3 5	4 17 15 7 3	7 6 36 17 8
Use macros	31 18 12 3 15	4 12 21 11 3	6 11 14 16 8	9 6 36 16 8
Write comments in program.	3 4 12 30 42	3 6 33 27 9	1 7 22 24 25	8 0 43 17 10
Write instructions for internal/external controls.	18 13 11 11 18	6 11 11 7 4	4 8 31 12 8	4 23 29 51 5

LEVEL PROGRAMMER TASK INVENTORY

CODING (Continued)

	FREQUENCY 1=Never 2=< Monthly 3=Monthly 4=Weekly 5=Daily					PERFORMANCE 1=Very Low 2=Low 3=Average 4=High 5=Very High					IMPORTANCE 1=Slight 2=Some 3=Important 4=Very 5=Critical					FUTURE NEED 1=Very Low 2=Low 3=No Change 4=High 5=Very High				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Write edit routines.	1	13	21	24	22	0	6	45	23	6	1	4	29	36	30	0	0	47	23	20
Write check digit checking routines.	45	25	3	4	4	4	13	21	4	0	5	16	14	5	1	11	22	37	9	1
Write check point-restart instructions	46	21	7	4	1	8	12	15	5	0	5	17	9	7	2	9	9	31	13	6
Write form test pattern routines	51	23	3	1	2	6	10	14	3	2	9	12	9	4	1	16	8	37	8	1
Use coding sheets.	1	1	3	8	67	0	0	24	29	24	1	4	27	15	30	1	1	52	8	11
Other _____	1	0	1	0	1	0	0	1	2	0	0	0	2	0	1	0	0	4	0	0

TESTING AND DEBUGGING

	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Read a program listing	0	0	1	4	76	0	3	25	36	17	0	1	13	28	39	0	0	43	15	13
Desk check a program	0	0	0	15	64	3	5	27	30	16	0	2	13	30	36	0	0	39	19	22
Correct syntax (clerical) errors	1	0	3	37	60	0	2	25	39	14	1	3	15	29	32	3	0	64	15	17
Correct logical errors	0	1	4	20	54	1	6	25	27	12	0	1	14	32	34	0	0	39	19	21
Read a trace	18	19	20	14	10	6	11	25	12	2	4	13	24	14	7	6	8	45	12	5
Read a memory dump	15	10	11	28	17	7	14	11	15	2	3	10	26	18	12	5	8	16	18	7
Read a file dump	4	6	18	26	27	2	6	40	22	6	1	5	32	21	17	1	0	47	22	8
Read a cross-reference listing	12	7	11	19	32	2	6	31	26	7	2	7	31	19	13	3	3	50	14	8
Test program using test data	0	1	8	28	44	0	4	36	25	15	1	0	25	22	32	0	0	40	20	20
Test program using live (user) data.	4	7	18	28	23	1	10	15	18	13	3	3	23	20	30	1	3	38	20	18
Edit program for effective use of auxiliary storage.	28	24	15	6	7	5	18	20	9	3	5	15	19	10	8	5	6	43	10	7
Recommend corrections or modifications to programs	8	13	23	21	16	3	15	39	9	7	3	11	36	15	9	1	0	46	19	10
Other _____	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	4	0	0

DOCUMENTATION

	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Prepare a program documentation manual	18	19	18	15	11	5	13	30	25	4	3	3	29	24	8	3	2	32	24	17
Write computer operator instructions	6	12	24	18	21	4	12	37	25	7	3	6	28	24	16	1	4	38	22	15
Write documentation updates after a program revision	4	17	17	25	26	4	14	38	13	7	3	3	32	26	12	1	2	37	24	15
Summarize the controls in program to detect errors	15	20	24	13	9	4	12	34	13	2	2	10	28	19	7	2	4	36	27	9
Summarize calculations used in program	20	26	20	13	10	3	11	37	9	2	2	8	27	19	5	5	8	27	23	8
Other _____	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

L. PROGRAMMER TASK INVENTORY

ELLANEOUS

	FREQUENCY					PERFORMANCE					IMPORTANCE					FUTURE NEED				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
unch program	19	24	11	19	8	5	9	25	22	7	17	26	18	5	1	18	10	43	4	0
h computer programs.	31	11	12	10	16	5	2	30	12	6	5	10	21	11	8	11	5	39	9	9
orm program maintenance.	1	6	18	24	32	0	6	43	23	8	1	4	27	30	18	8	1	43	24	12
ert a program to another language.	32	25	3	0	2	9	4	19	5	1	10	11	14	4	0	22	7	31	7	2
ate computer for program tests	11	10	7	13	20	8	7	20	11	10	9	13	19	12	6	13	12	40	10	2
Job control language (Control Cards)	1	7				2	6	30	20	14	1	3	24	20	23	3	3	36	20	16
virtual storage techniques	41	3	12	12	12	7	6	22	7	3	5	5	26	7	3	14	1	32	15	11
orm number system arithmetic	27	14	5	17	18	4	7	27	15	4	7	9	23	15	4	12	2	50	8	3
ert numbers between number systems	29	17	9	10	16	5	7	24	15	5	8	8	16	20	4	13	6	44	7	3
are printer carriage tape.	42	34	2	2	1	9	10	24	2	2	9	21	16	1	1	17	12	41	3	2
r	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0

ction 7.00--GENERAL EDUCATION AND LEARNING EXPERIENCES was not filled out by the Employer/Supervisor group.

APPENDIX O

RANKS, MEAN, STANDARD ERROR OF THE MEAN, STANDARD DEVIATION,
STANDARD ERROR OF THE STANDARD DEVIATION, AND
RANK DIFFERENCE FOR ALL TASKS BY ITEM NUMBER

F R E Q U E N C Y

GRADUATE						EMPLOYER						RANK DIFF
ITEM NO.	ITEM RANK	MEAN	S.E. MEAN	S.D.	S.E. S.D.	ITEM RANK	MEAN	S.E. MEAN	S.D.	S.E. S.D.		
1.01	08.0	4.10	0.11	1.26	0.08	17.5	3.65	0.18	1.65	0.13	09.5	
1.02	51.0		0.11	1.27	0.08	54.0	2.04	0.13	1.21	0.10	13.0	
1.03	37.0		0.12	1.36	0.08	2.00	0.15	1.36	0.11	03.0		
1.04	19.0		0.12	1.37	0.08	12.5	1.99	0.14	1.29	0.10	08.5	
1.05	07.0	4	0.10	1.07	0.06	09.0	4.07	0.13	1.17	0.09	02.0	
1.06	55.0	2.30	0.10	1.12	0.07	61.0	2.17	0.14	1.27	0.10	06.0	
1.07	49.0	2.49	0.09	1.08	0.07	52.0	2.58	0.15	1.31	0.10	03.0	
1.08	34.0	2.06	0.09	1.08	0.07	35.0	3.04	0.14	1.26	0.10	01.0	
1.09	57.5	2.27	0.10	1.17	0.07	58.0	2.28	0.14	1.23	0.10	00.5	
1.10	45.0	2.59	0.10	1.20	0.07	45.0	2.73	0.14	1.28	0.10	00.0	
1.11	75.0	1.12	0.04	0.43	0.03	75.0	1.33	0.09	0.82	0.07	00.0	
2.01	25.0	3.26	0.10	1.22	0.07	23.5	3.44	0.15	1.39	0.11	01.5	
2.02	35.5	3.01	0.09	1.10	0.07	33.0	3.11	0.14	1.27	0.10	02.5	
2.03	50.0	2.47	0.10	1.20	0.07	46.0	2.68	0.15	1.36	0.11	04.0	
2.04	74.0	1.23	0.05	0.55	0.03	72.0	1.51	0.09	0.83	0.07	02.0	
2.05	73.0	1.52	0.07	0.83	0.05	67.0	1.79	0.11	1.01	0.08	06.0	
2.06	59.5	2.26	0.10	1.17	0.07	54.0	2.53	0.15	1.37	0.11	05.5	
2.07	26.0	3.22	0.13	1.51	0.09	38.5	2.81	0.19	1.69	0.13	12.5	
2.08	18.0	3.55	0.09	1.11	0.07	13.5	3.81	0.11	1.03	0.08	04.5	
2.09	09.0	4.05	0.10	1.11	0.07	22.0	3.49	0.17	1.52	0.12	13.0	
2.10	47.0	2.55	0.12	1.34	0.08	56.0	2.40	0.16	1.40	0.11	09.0	
3.01	65.0	1.11	0.11	1.28	0.08	69.0	1.65	0.13	1.19	0.09	01.0	
3.02	13.0	3.86	0.13	1.53	0.09	12.0	3.91	0.18	1.62	0.13	01.0	
3.03	63.0	2.06	0.14	1.58	0.10	61.0	2.17	0.17	1.49	0.12	02.0	
3.04	59.5	3.26	0.12	1.38	0.08	53.0	2.56	0.16	1.48	0.12	06.5	
3.05	23.5	3.34	0.11	1.29	0.08	16.0	3.73	0.13	1.20	0.09	07.0	
3.06	30.0	3.13	0.10	1.18	0.07	34.0	3.07	0.14	1.28	0.10	04.0	
3.07	28.0	3.17	0.10	1.15	0.07	31.0	3.21	0.14	1.25	0.10	03.0	
3.08	64.0	1.99	0.10	1.13	0.07	61.0	2.17	0.14	1.23	0.10	03.0	
3.09	20.0	3.50	0.11	1.26	0.08	25.0	3.41	0.15	1.37	0.11	05.0	
3.10	33.0	3.07	0.11	1.32	0.08	29.0	3.29	0.16	1.39	0.11	04.0	
3.11	43.0	2.63	0.12	1.34	0.08	48.0	2.65	0.15	1.34	0.11	05.0	
3.12	29.0	3.16	0.13	1.48	0.09	32.0	3.20	0.16	1.41	0.11	03.0	
3.13	24.0	3.33	0.11	1.29	0.08	27.0	3.32	0.16	1.43	0.11	03.0	
3.14	56.0	2.28	0.13	1.42	0.09	63.0	2.11	0.15	1.34	0.11	07.0	
3.15	40.0	2.91	0.12	1.42	0.09	36.0	2.98	0.15	1.36	0.11	04.0	
3.16	17.0	3.64	0.10	1.18	0.07	21.0	3.51	0.13	1.21	0.09	04.0	
3.17	27.0	3.19	0.13	1.47	0.09	20.0	3.54	0.15	1.38	0.11	07.0	
3.18	67.0	1.83	0.10	1.14	0.07	66.0	1.95	0.14	1.23	0.10	01.0	
3.19	52.0	2.37	0.13	1.49	0.09	55.0	2.41	0.17	1.50	0.12	03.0	
3.20	12.0	3.94	0.10	1.20	0.07	08.0	4.16	0.12	1.08	0.09	04.0	
3.21	42.0	2.76	0.12	1.42	0.09	37.0	2.87	0.16	1.42	0.11	05.0	
3.22	21.5	3.42	0.10	1.13	0.07	17.5	3.65	0.12	1.08	0.08	04.0	
3.23	66.0	1.88	0.09	1.09	0.07	68.0	1.73	0.12	1.08	0.08	02.0	
3.24	69.0	1.73	0.09	1.04	0.06	70.0	1.63	0.10	0.92	0.07	01.0	
3.25	70.0	1.70	0.09	1.05	0.07	73.0	1.50	0.09	0.84	0.07	03.0	
3.26	03.5	4.52	0.09	1.01	0.06	03.0	4.74	0.08	0.70	0.06	00.5	
4.01	01.0	4.85	0.04	0.50	0.03	01.0	4.93	0.03	0.31	0.02	00.0	
4.02	02.0	4.54	0.06	0.74	0.04	02.0	4.81	0.04	0.39	0.03	00.0	
4.03	03.5	4.52	0.07	0.79	0.05	04.0	4.67	0.07	0.67	0.05	00.5	
4.04	06.0	4.45	0.07	0.78	0.05	05.0	4.62	0.07	0.64	0.05	01.0	
4.05	57.5	2.27	0.10	1.19	0.07	44.0	2.74	0.15	1.31	0.10	13.5	
4.06	32.0	3.08	0.11	1.29	0.08	30.0	3.27	0.16	1.41	0.11	02.0	
4.07	14.5	3.68	0.10	1.12	0.07	13.5	3.81	0.12	1.12	0.09	01.0	
4.08	14.5	3.68	0.12	1.35	0.08	19.0	3.64	0.16	1.44	0.11	04.5	
4.09	10.0	4.04	0.08	0.92	0.06	06.0	4.42	0.08	0.72	0.06	04.0	
4.10	16.0	3.65	0.09	1.07	0.07	15.0	3.74	0.12	1.12	0.09	01.0	
4.11	62.0	2.20	0.11	1.30	0.08	59.0	2.25	0.14	1.25	0.10	03.0	
4.12	39.0	2.93	0.10	1.22	0.07	28.0	3.30	0.14	1.23	0.10	11.0	
5.01	48.0	2.51	0.11	1.27	0.08	41.0	2.78	0.15	1.34	0.11	07.0	
5.02	31.0	3.11	0.10	1.22	0.07	23.5	3.44	0.14	1.23	0.10	07.5	
5.03	38.0	2.96	0.10	1.19	0.07	26.0	3.35	0.14	1.22	0.10	12.0	
5.04	53.5	2.34	0.11	1.30	0.08	42.5	2.77	0.14	1.24	0.10	11.0	
5.05	61.0	2.25	0.11	1.22	0.07	49.0	2.64	0.15	1.32	0.10	12.0	
6.01	44.0	2.61	0.11	1.31	0.08	47.0	2.67	0.15	1.32	0.10	03.0	
6.02	21.5	3.42	0.13	1.48	0.09	50.0	2.61	0.18	1.57	0.12	28.5	
6.03	11.0	3.96	0.09	1.07	0.06	10.5	3.99	0.11	1.01	0.08	00.5	
6.04	71.0	1.56	0.07	0.83	0.05	74.0	1.46	0.09	0.79	0.06	03.0	
6.05	35.5	3.01	0.14	1.62	0.10	42.5	2.77	0.18	1.66	0.13	07.0	
6.06	05.0	4.49	0.10	1.15	0.07	07.0	4.37	0.14	1.24	0.10	02.0	
6.07	53.5	2.34	0.14	1.63	0.10	57.0	2.39	0.18	1.57	0.12	03.5	
6.08	41.0	2.81	0.14	1.58	0.10	38.5	2.81	0.18	1.60	0.13	02.5	
6.09	46.0	2.56	0.13	1.47	0.09	51.0	2.59	0.17	1.55	0.12	05.0	
6.10	72.0	1.53	0.06	0.66	0.04	71.0	1.59	0.09	0.77	0.06	01.0	

PERFORMANCE

GRADUATE					EMPLOYER					RANK DIFF
ITEM NO.	ITEM RANK	MEAN	S.E. MEAN	S.D.	ITEM RANK	MEAN	S.E. MEAN	S.D.	S.E. S.D.	
1	46	0	0.07	0	51	0	0.10	0	0.07	0
2	46	0	0.09	0	51	0	0.11	0	0.08	0
3	46	0	0.09	0	51	0	0.11	0	0.08	0
4	46	0	0.08	0	51	0	0.11	0	0.09	0
5	46	0	0.07	0	51	0	0.11	0	0.08	0
6	46	0	0.10	0	51	0	0.11	0	0.06	0
7	46	0	0.09	0	51	0	0.11	0	0.09	0
8	46	0	0.08	0	51	0	0.11	0	0.08	0
9	46	0	0.10	0	51	0	0.11	0	0.08	0
10	46	0	0.08	0	51	0	0.11	0	0.08	0
11	46	0	0.09	0	51	0	0.11	0	0.08	0
12	46	0	0.08	0	51	0	0.11	0	0.08	0
13	46	0	0.09	0	51	0	0.11	0	0.08	0
14	46	0	0.08	0	51	0	0.11	0	0.08	0
15	46	0	0.09	0	51	0	0.11	0	0.08	0
16	46	0	0.08	0	51	0	0.11	0	0.08	0
17	46	0	0.09	0	51	0	0.11	0	0.08	0
18	46	0	0.08	0	51	0	0.11	0	0.08	0
19	46	0	0.09	0	51	0	0.11	0	0.08	0
20	46	0	0.08	0	51	0	0.11	0	0.08	0
21	46	0	0.09	0	51	0	0.11	0	0.08	0
22	46	0	0.08	0	51	0	0.11	0	0.08	0
23	46	0	0.09	0	51	0	0.11	0	0.08	0
24	46	0	0.08	0	51	0	0.11	0	0.08	0
25	46	0	0.09	0	51	0	0.11	0	0.08	0
26	46	0	0.08	0	51	0	0.11	0	0.08	0
27	46	0	0.09	0	51	0	0.11	0	0.08	0
28	46	0	0.08	0	51	0	0.11	0	0.08	0
29	46	0	0.09	0	51	0	0.11	0	0.08	0
30	46	0	0.08	0	51	0	0.11	0	0.08	0
31	46	0	0.09	0	51	0	0.11	0	0.08	0
32	46	0	0.08	0	51	0	0.11	0	0.08	0
33	46	0	0.09	0	51	0	0.11	0	0.08	0
34	46	0	0.08	0	51	0	0.11	0	0.08	0
35	46	0	0.09	0	51	0	0.11	0	0.08	0
36	46	0	0.08	0	51	0	0.11	0	0.08	0
37	46	0	0.09	0	51	0	0.11	0	0.08	0
38	46	0	0.08	0	51	0	0.11	0	0.08	0
39	46	0	0.09	0	51	0	0.11	0	0.08	0
40	46	0	0.08	0	51	0	0.11	0	0.08	0
41	46	0	0.09	0	51	0	0.11	0	0.08	0
42	46	0	0.08	0	51	0	0.11	0	0.08	0
43	46	0	0.09	0	51	0	0.11	0	0.08	0
44	46	0	0.08	0	51	0	0.11	0	0.08	0
45	46	0	0.09	0	51	0	0.11	0	0.08	0
46	46	0	0.08	0	51	0	0.11	0	0.08	0
47	46	0	0.09	0	51	0	0.11	0	0.08	0
48	46	0	0.08	0	51	0	0.11	0	0.08	0
49	46	0	0.09	0	51	0	0.11	0	0.08	0
50	46	0	0.08	0	51	0	0.11	0	0.08	0
51	46	0	0.09	0	51	0	0.11	0	0.08	0
52	46	0	0.08	0	51	0	0.11	0	0.08	0
53	46	0	0.09	0	51	0	0.11	0	0.08	0
54	46	0	0.08	0	51	0	0.11	0	0.08	0
55	46	0	0.09	0	51	0	0.11	0	0.08	0
56	46	0	0.08	0	51	0	0.11	0	0.08	0
57	46	0	0.09	0	51	0	0.11	0	0.08	0
58	46	0	0.08	0	51	0	0.11	0	0.08	0
59	46	0	0.09	0	51	0	0.11	0	0.08	0
60	46	0	0.08	0	51	0	0.11	0	0.08	0
61	46	0	0.09	0	51	0	0.11	0	0.08	0
62	46	0	0.08	0	51	0	0.11	0	0.08	0
63	46	0	0.09	0	51	0	0.11	0	0.08	0
64	46	0	0.08	0	51	0	0.11	0	0.08	0
65	46	0	0.09	0	51	0	0.11	0	0.08	0
66	46	0	0.08	0	51	0	0.11	0	0.08	0
67	46	0	0.09	0	51	0	0.11	0	0.08	0
68	46	0	0.08	0	51	0	0.11	0	0.08	0
69	46	0	0.09	0	51	0	0.11	0	0.08	0
70	46	0	0.08	0	51	0	0.11	0	0.08	0
71	46	0	0.09	0	51	0	0.11	0	0.08	0
72	46	0	0.08	0	51	0	0.11	0	0.08	0
73	46	0	0.09	0	51	0	0.11	0	0.08	0
74	46	0	0.08	0	51	0	0.11	0	0.08	0
75	46	0	0.09	0	51	0	0.11	0	0.08	0
76	46	0	0.08	0	51	0	0.11	0	0.08	0
77	46	0	0.09	0	51	0	0.11	0	0.08	0
78	46	0	0.08	0	51	0	0.11	0	0.08	0
79	46	0	0.09	0	51	0	0.11	0	0.08	0
80	46	0	0.08	0	51	0	0.11	0	0.08	0
81	46	0	0.09	0	51	0	0.11	0	0.08	0
82	46	0	0.08	0	51	0	0.11	0	0.08	0
83	46	0	0.09	0	51	0	0.11	0	0.08	0
84	46	0	0.08	0	51	0	0.11	0	0.08	0
85	46	0	0.09	0	51	0	0.11	0	0.08	0
86	46	0	0.08	0	51	0	0.11	0	0.08	0
87	46	0	0.09	0	51	0	0.11	0	0.08	0
88	46	0	0.08	0	51	0	0.11	0	0.08	0
89	46	0	0.09	0	51	0	0.11	0	0.08	0
90	46	0	0.08	0	51	0	0.11	0	0.08	0
91	46	0	0.09	0	51	0	0.11	0	0.08	0
92	46	0	0.08	0	51	0	0.11	0	0.08	0
93	46	0	0.09	0	51	0	0.11	0	0.08	0
94	46	0	0.08	0	51	0	0.11	0	0.08	0
95	46	0	0.09	0	51	0	0.11	0	0.08	0
96	46	0	0.08	0	51	0	0.11	0	0.08	0
97	46	0	0.09	0	51	0	0.11	0	0.08	0
98	46	0	0.08	0	51	0	0.11	0	0.08	0
99	46	0	0.09	0	51	0	0.11	0	0.08	0
100	46	0	0.08	0	51	0	0.11	0	0.08	0

MEAN RANK DIFFERENCE IS 5.7

IMPORTANCE

ITEM NO.	ITEM RANK	GRADUATE				ITEM RANK	EMPLOYER				RANK DIFF
		MEAN	S.E. MEAN	S.D.	S.E. S.D.		MEAN	S.E. MEAN	S.D.	S.E. S.D.	
1.01	43.0	3.27	0.10	1.09	0.07	27.5	3.41	0.13	1.06	0.09	15.5
1.02	62.0	2.99	0.11	1.12	0.08	56.0	3.04	0.14	0.97	0.10	06.0
1.03	31.0	3.50	0.10	1.07	0.07	52.0	3.08	0.15	1.18	0.10	21.0
1.04	25.0	3.62	0.09	0.98	0.06	13.5	3.68	0.11	0.98	0.08	11.5
1.05	12.0	3.78	0.08	0.86	0.05	13.5	3.68	0.10	0.91	0.07	01.5
1.06	63.0	2.94	0.10	1.05	0.07	56.0	3.04	0.15	1.08	0.10	07.0
1.07	55.0	3.11	0.10	1.06	0.07	49.5	3.11	0.15	1.20	0.11	05.5
1.08	40.0	3.37	0.09	0.97	0.06	36.0	3.34	0.11	0.91	0.08	04.0
1.09	48.5	3.18	0.11	1.04	0.08	36.0	3.34	0.15	1.06	0.10	10.5
1.10	35.0	3.46	0.10	1.03	0.07	18.0	3.58	0.12	0.95	0.08	17.0
1.11	75.0	1.73	0.17	1.05	0.12	75.0	1.96	0.22	1.14	0.15	00.0
1.01	50.5	3.15	0.10	1.10	0.07	44.5	3.22	0.12	1.04	0.09	06.0
1.02	42.0	3.32	0.10	1.10	0.07	24.5	3.46	0.11	0.94	0.08	17.5
1.03	57.5	3.09	0.11	1.13	0.07	36.0	3.34	0.13	1.04	0.09	21.5
1.04	74.0	1.77	0.11	0.78	0.08	74.0	2.12	0.15	0.87	0.11	00.0
1.05	71.0	2.40	0.12	0.96	0.09	69.0	2.36	0.15	0.98	0.10	02.0
1.06	57.5	3.09	0.11	1.11	0.08	47.0	3.19	0.14	1.07	0.10	10.5
1.07	39.0	3.39	0.10	1.02	0.07	32.0	3.38	0.17	1.20	0.12	07.0
1.08	11.0	3.85	0.09	1.01	0.06	09.0	3.87	0.12	1.02	0.08	02.0
1.09	23.0	3.63	0.09	0.96	0.06	46.0	3.21	0.14	1.15	0.10	23.0
1.10	41.0	3.36	0.11	1.06	0.08	26.0	3.42	0.14	1.04	0.10	15.0
1.11	48.0	3.17	0.16	1.25	0.12	64.5	2.74	0.22	1.22	0.15	16.5
1.01	61.0	3.01	0.14	1.18	0.10	66.0	2.69	0.21	1.43	0.15	05.0
1.02	07.0	4.02	0.09	0.95	0.06	08.0	3.88	0.13	1.07	0.09	01.0
1.03	67.0	2.84	0.16	1.35	0.11	59.0	2.98	0.19	1.35	0.14	08.0
1.04	50.0	3.15	0.13	1.16	0.09	56.0	3.04	0.13	0.97	0.09	05.5
1.05	28.0	3.59	0.09	1.02	0.07	29.5	3.39	0.10	0.90	0.07	01.5
1.06	38.0	3.42	0.09	0.97	0.06	38.0	3.32	0.11	0.91	0.08	00.0
1.07	34.0	3.47	0.09	0.98	0.06	27.5	3.41	0.10	0.84	0.07	06.5
1.08	64.0	2.91	0.12	1.07	0.08	63.0	2.79	0.13	0.96	0.09	01.0
1.09	18.5	3.70	0.08	0.87	0.06	22.5	3.47	0.12	0.97	0.08	04.0
1.10	21.0	3.55	0.08	0.89	0.06	21.0	3.50	0.11	0.89	0.08	00.0
1.11	31.0	3.50	0.09	0.97	0.07	42.5	3.23	0.12	0.98	0.09	11.5
1.12	26.0	3.61	0.10	1.04	0.07	34.0	3.37	0.10	0.83	0.07	07.5
1.13	36.5	3.43	0.09	1.02	0.06	41.0	3.25	0.12	0.97	0.08	04.5
1.14	36.5	3.43	0.12	1.07	0.09	52.0	3.08	0.16	1.11	0.11	15.5
1.15	29.0	3.58	0.10	1.00	0.07	32.0	3.38	0.11	0.88	0.08	03.0
1.16	15.5	3.75	0.09	1.09	0.06	19.0	3.56	0.09	0.75	0.06	03.5
1.17	26.5	3.61	0.10	1.09	0.07	29.5	3.39	0.12	0.99	0.08	03.0
1.18	66.0	2.89	0.13	1.06	0.09	64.5	2.74	0.15	1.03	0.11	00.5
1.19	60.0	3.07	0.12	1.08	0.08	52.0	3.08	0.17	1.19	0.12	08.0
1.20	16.0	3.76	0.10	1.07	0.07	10.0	3.82	0.11	1.02	0.08	04.0
1.21	33.0	3.48	0.11	1.09	0.08	42.5	3.23	0.13	1.01	0.09	09.5
1.22	15.5	3.75	0.08	0.91	0.06	15.5	3.63	0.09	0.81	0.06	00.0
1.23	66.0	2.87	0.13	1.10	0.09	68.0	2.54	0.15	0.94	0.10	02.0
1.24	68.0	2.83	0.14	1.13	0.10	67.0	2.60	0.17	1.07	0.12	01.0
1.25	69.0	2.64	0.13	0.99	0.09	70.5	2.31	0.18	1.06	0.13	01.5
1.26	08.0	3.97	0.10	1.11	0.07	07.0	3.90	0.12	1.03	0.08	01.0
1.01	02.0	4.37	0.07	0.79	0.05	01.0	4.30	0.09	0.78	0.06	01.0
1.02	04.0	4.15	0.08	0.92	0.06	02.0	4.23	0.09	0.81	0.06	02.0
1.03	03.0	4.16	0.08	0.90	0.06	04.0	4.10	0.10	0.92	0.07	01.0
1.04	55.0	3.40	0.07	0.79	0.05	03.0	4.22	0.09	0.74	0.06	02.0
1.05	55.0	3.11	0.11	1.09	0.08	49.5	3.11	0.13	1.03	0.09	05.5
1.06	23.0	3.63	0.10	1.11	0.07	32.0	3.38	0.13	1.06	0.09	09.0
1.07	17.0	3.74	0.08	0.95	0.06	15.5	3.63	0.11	0.94	0.08	01.5
1.08	18.5	3.70	0.09	1.03	0.07	22.5	3.47	0.12	0.99	0.08	04.0
1.09	06.0	4.07	0.07	0.83	0.05	05.0	4.05	0.10	0.91	0.07	01.0
1.10	09.0	3.95	0.08	0.97	0.06	06.0	3.95	0.12	1.04	0.08	03.0
1.11	52.0	3.14	0.12	1.11	0.08	61.0	2.95	0.15	1.12	0.11	09.0
1.12	44.0	3.24	0.09	1.02	0.07	44.5	3.22	0.11	0.98	0.08	00.5
1.01	31.0	3.50	0.11	1.17	0.08	24.5	3.46	0.11	0.92	0.08	06.5
1.02	13.0	3.77	0.09	0.96	0.06	17.0	3.61	0.12	1.01	0.08	04.0
1.03	23.0	3.63	0.09	0.96	0.06	20.0	3.54	0.11	0.94	0.08	03.0
1.04	46.5	3.18	0.11	1.09	0.08	39.0	3.29	0.12	0.95	0.08	07.5
1.05	55.0	3.11	0.11	1.05	0.08	40.0	3.26	0.12	0.91	0.08	15.0
1.01	70.0	2.48	0.10	1.03	0.07	73.0	2.21	0.12	0.95	0.08	03.0
1.02	20.0	3.67	0.11	1.13	0.07	48.0	3.13	0.15	1.15	0.11	28.0
1.03	10.0	3.92	0.08	0.87	0.05	12.0	3.75	0.10	0.90	0.07	02.0
1.04	72.0	3.37	0.13	1.07	0.09	70.5	2.31	0.15	0.96	0.11	01.5
1.05	53.0	3.13	0.12	1.25	0.09	62.0	2.88	0.16	1.19	0.11	09.0
1.06	05.0	4.10	0.08	0.95	0.06	11.0	3.78	0.12	1.06	0.09	06.0
1.07	59.0	3.08	0.14	1.22	0.10	60.0	2.96	0.14	0.98	0.10	01.0
1.08	45.0	3.23	0.12	1.15	0.08	58.0	3.00	0.14	1.08	0.10	13.0
1.09	49.0	3.16	0.12	1.22	0.09	54.0	3.07	0.16	1.16	0.11	05.0
1.10	73.0	2.20	0.11	0.95	0.08	72.0	2.25	0.12	0.85	0.09	01.0

MEAN RANK DIFFERENCE IS 6.3

FUTURE NEED

GRADUATE						EMPLOYER						RANK DIFF
ITEM NO.	ITEM RANK	MEAN	S.E. MEAN	S.D.	S.E. S.D.	ITEM RANK	MEAN	S.E. MEAN	S.D.	S.E. S.D.		
1.01	20.0	3.67	0.09	1.03	0.06	09.0	3.69	0.13	1.11	0.09	11.0	
1.02	49.0	3.30	0.10	1.07	0.07	43.0	3.22	0.14	1.26	0.10	06.0	
1.03	11.5	3.77	0.08	0.94	0.06	19.0	3.56	0.12	1.04	0.08	07.5	
1.04	26.0	3.57	0.08	0.96	0.06	10.0	3.68	0.10	0.91	0.07	15.5	
1.05	14.0	3.71	0.07	0.86	0.05	13.0	3.64	0.08	0.73	0.06	01.5	
1.06	44.5	3.33	0.09	0.99	0.06	46.0	3.11	0.12	1.06	0.09	01.5	
1.07	59.5	3.02	0.09	0.98	0.06	60.0	2.87	0.12	1.03	0.08	00.0	
1.08	42.0	3.35	0.07	0.75	0.05	41.0	3.28	0.11	0.95	0.08	01.5	
1.09	35.0	3.18	0.08	0.99	0.06	36.0	3.29	0.12	1.06	0.09	00.0	
1.10	75.0	3.77	0.10	1.03	0.07	75.0	3.87	0.13	1.10	0.09	00.0	
2.01	50.0	3.22	0.08	0.93	0.06	50.0	3.08	0.11	0.92	0.07	00.0	
2.02	39.0	3.44	0.09	1.00	0.06	44.0	3.21	0.11	0.94	0.08	05.0	
2.03	54.0	3.00	0.09	0.97	0.07	53.0	3.00	0.12	1.02	0.08	00.0	
2.04	77.0	3.00	0.09	0.95	0.06	74.0	3.32	0.12	0.99	0.08	00.0	
2.05	71.0	3.52	0.10	1.05	0.07	68.0	3.64	0.12	1.03	0.09	00.0	
2.06	47.0	3.11	0.11	1.20	0.08	48.0	3.11	0.13	1.11	0.09	00.0	
2.07	08.0	3.79	0.10	1.09	0.07	08.0	3.71	0.10	0.86	0.07	06.0	
2.08	08.0	3.79	0.08	0.93	0.06	20.0	3.81	0.10	0.86	0.07	06.0	
2.09	33.0	3.33	0.07	0.88	0.05	24.0	3.49	0.10	0.86	0.07	06.0	
2.10	64.0	3.13	0.09	1.00	0.08	63.0	3.26	0.12	1.03	0.08	04.0	
2.11	66.0	3.79	0.11	1.16	0.07	69.0	3.79	0.14	1.23	0.10	03.0	
2.12	07.0	3.88	0.11	1.12	0.06	03.0	3.99	0.11	0.99	0.08	10.0	
2.13	69.0	3.63	0.10	1.11	0.08	65.0	3.79	0.11	1.19	0.08	03.0	
2.14	55.0	3.77	0.10	1.18	0.07	56.0	3.84	0.12	1.02	0.08	07.0	
2.15	32.0	3.63	0.08	0.99	0.06	33.0	3.55	0.09	0.88	0.06	11.0	
2.16	77.0	3.63	0.08	0.94	0.06	78.0	3.55	0.08	0.68	0.06	03.0	
2.17	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.18	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.19	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.20	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.21	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.22	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.23	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.24	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.25	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.26	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.27	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.28	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.29	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.30	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.31	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.32	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.33	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.34	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.35	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.36	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.37	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.38	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.39	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.40	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.41	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.42	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.43	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.44	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.45	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.46	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.47	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.48	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.49	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.50	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.51	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.52	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.53	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.54	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.55	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.56	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.57	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.58	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.59	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.60	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.61	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.62	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.63	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.64	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.65	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.66	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.67	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.68	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.69	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.70	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.71	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.72	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.73	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.74	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.75	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.76	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.77	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.78	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.79	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.80	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.81	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.82	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.83	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.84	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.85	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.86	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.87	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.88	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.89	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.90	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.91	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.92	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.93	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.94	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.95	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08	0.68	0.06	03.0	
2.96	66.0	3.63	0.08	0.99	0.06	67.0	3.55	0.08	0.68	0.06	03.0	
2.97	33.0	3.63	0.08	0.99	0.06	34.0	3.55	0.08</				

APPENDIX P

RANKS FOR ALL TASKS BY DESCRIPTION

F R E Q U E N C Y

ITEM NO.	TASK DESCRIPTION	GRAD RANK	EMP RANK
4.01	READ A PROGRAM LISTING	01.0	01.0
4.02	DESK CHECK A PROGRAM	02.0	02.0
3.26	USE CODING SHEETS	03.5	03.0
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	03.5	04.0
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	05.0	07.0
4.04	CORRECT LOGICAL ERRORS	06.0	05.0
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	07.0	09.0
1.01	USE COMPANY SYSTEM STANDARDS	08.0	17.5
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	09.0	22.0
4.09	TEST PROGRAM USING TEST DATA	10.0	06.0
6.03	PERFORM PROGRAM MAINTENANCE	11.0	10.5
3.20	WRITE COMMENTS IN PROGRAM	12.0	08.0
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	13.0	12.0
4.07	READ A FILE DUMP	14.5	13.5
4.08	READ A CROSS-REFERENCE LISTING	14.5	19.0
4.10	TEST PROGRAM USING LIVE (USER) DATA	16.0	15.0
3.16	WRITE ERROR ROUTINES	17.0	21.0
2.08	PREPARE A TEST DATA FOR PROGRAMS	18.0	13.5
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	19.0	10.5
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	20.0	25.0
3.22	WRITE EDIT ROUTINES	21.5	17.5
6.02	PATCH COMPUTER PROGRAMS	21.5	50.0
3.05	USE DISK SORT UTILITY ROUTINES	23.0	16.0
3.13	USE CARD FILE HANDLING ROUTINES	24.0	27.0
2.01	USE STANDARD FLOWCHART SYMBOLS	25.0	23.5
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES	26.0	38.5
3.17	USE LIBRARY ROUTINES	27.0	20.0
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	28.0	31.0
3.12	USE TAPE FILE HANDLING ROUTINES	29.0	32.0
3.06	WRITE TABLE BUILDING INSTRUCTIONS	30.0	34.0
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	31.0	23.5
4.06	READ A MEMORY DUMP	32.0	30.0
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	33.0	29.0
1.08	PREPARE A PRINTER SPACING FORM	34.0	35.0
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART	35.5	33.0
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	35.5	42.5
1.03	WORK WITH USERS ON PROBLEM	37.0	40.0
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	38.0	26.0
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	39.0	28.0
3.15	WRITE SUBROUTINES	40.0	36.0
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	41.0	38.5
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS	42.0	37.0
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	43.0	48.0
6.01	KEYPUNCH PROGRAM	44.0	47.0
1.10	PREPARE A DISK RECORD LAYOUT	45.0	45.0
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	46.0	51.0
2.10	SELECT FILE ORGANIZATION & ACCESS METHODS FOR DATA FILES	47.0	56.0
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	48.0	41.0
1.07	PREPARE A CARD RECORD LAYOUT	49.0	52.0
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	50.0	46.0
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM	51.0	64.0
3.19	USE MACROS	52.0	55.0
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	53.5	42.5
6.07	USE VIRTUAL STORAGE TECHNIQUES	53.5	37.0
1.06	PREPARE A SYSTEM FLOWCHART	55.0	61.0
3.14	USE DATA COMMUNICATIONS ROUTINES	56.0	63.0
1.09	PREPARE A TAPE RECORD LAYOUT	57.5	58.0
4.05	READ A TRACE	57.5	44.0
2.06	DIVIDE A PROGRAM INTO MODULES	59.5	56.0
3.04	USE TAPE SORT UTILITY ROUTINES	59.5	53.0
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	61.0	49.0
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	62.0	59.0
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	63.0	61.0
3.08	WRITE TABLE SORTING INSTRUCTIONS	64.0	61.0
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS	65.0	65.0
3.23	WRITE CHECK DIGIT CHECKING ROUTINES	66.0	68.0
3.18	WRITE LIBRARY ROUTINES	67.0	66.0
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM	68.0	69.0
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	69.0	70.0
3.25	WRITE FORM TEST PATTERN ROUTINES	70.0	73.0
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE	71.0	74.0
6.10	PREPARE PRINTER CARRIAGE TAPE	72.0	71.0
2.05	PREPARE A DECISION TABLE	73.0	67.0
2.04	PREPARE A GRID CHART	74.0	72.0
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	75.0	75.0

P E R F O R M A N C E

ITEM NO.	TASK DESCRIPTION	GRAD RANK	EMP RANK
3.26	USE CODING SHEETS.	01.0	01.0
4.01	READ A PROGRAM LISTING	02.0	02.0
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	03.0	03.0
4.04	CORRECT LOGICAL ERRORS	04.0	06.5
4.02	DESK CHECK A PROGRAM	05.0	05.0
3.20	WRITE COMMENTS IN PROGRAM	06.0	05.0
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	07.0	06.0
4.08	READ A CROSS-REFERENCE LISTING	08.0	06.0
4.09	TEST PROGRAM USING TEST DATA	08.5	06.0
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	09.0	06.0
3.16	WRITE ERROR ROUTINES	10.0	06.0
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	11.0	06.0
3.05	USE DISK SORT UTILITY ROUTINES	12.0	16.0
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	14.0	16.0
3.13	USE CARD FILE HANDLING ROUTINES	15.0	09.0
4.10	TEST PROGRAM USING LIVE (USER) DATA	16.0	18.0
4.07	READ A FILE DUMP	17.0	23.0
6.03	PERFORM PROGRAM MAINTENANCE	17.5	14.0
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	19.0	09.0
1.08	PREPARE A PRINTER SPACING FORM	19.5	16.0
2.08	PREPARE A TEST DATA FOR PROGRAMS	21.0	16.0
3.22	WRITE EDIT ROUTINES	21.5	19.0
2.01	USE STANDARD FLOWCHART SYMBOLS	22.0	19.0
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART	22.5	23.0
3.12	USE TAPE FILE HANDLING ROUTINES	22.5	09.0
1.10	PREPARE A DISK RECORD LAYOUT	22.6	31.0
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	22.7	25.0
3.17	USE LIBRARY ROUTINES	22.7	23.0
3.06	WRITE TABLE BUILDING INSTRUCTIONS	22.9	23.0
1.07	PREPARE A CARD RECORD LAYOUT	23.1	21.0
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	23.1	24.0
3.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	23.1	24.0
3.15	WRITE SUBROUTINES	23.3	40.0
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	23.3	27.0
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES	23.3	44.0
5.02	PATCH COMPUTER PROGRAMS	23.6	31.0
1.09	PREPARE A TAPE RECORD LAYOUT	23.7	33.0
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	23.8	43.0
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	23.9	34.0
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	23.9	66.0
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS	24.1	60.0
3.04	USE TAPE SORT UTILITY ROUTINES	24.2	38.0
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	24.3	46.0
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	24.4	40.0
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	24.5	47.0
1.01	USE COMPANY SYSTEM STANDARDS	26.0	31.0
4.06	READ A MEMORY DUMP	27.0	38.0
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM	28.0	60.0
6.01	KEYPUNCH PROGRAM	29.0	29.0
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	30.0	45.0
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	30.5	47.0
1.03	WORK WITH USERS ON PROBLEM	32.0	63.0
4.05	READ A TRACE	33.0	37.0
3.14	USE DATA COMMUNICATIONS ROUTINES	33.5	72.0
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	33.5	49.0
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	33.5	53.0
1.06	PREPARE A SYSTEM FLOWCHART	37.0	47.0
2.10	SELECT FILE ORGANIZATION & ACCESS METHODS FOR DATA FILES	37.5	55.0
2.06	DIVIDE A PROGRAM INTO MODULES	39.0	49.0
3.19	USE MACROS	60.0	53.0
3.08	WRITE TABLE SORTING INSTRUCTIONS	61.0	56.0
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	61.5	62.0
3.23	WRITE CHECK DIGIT CHECKING ROUTINES	62.0	68.0
6.07	USE VIRTUAL STORAGE TECHNIQUES	62.5	60.0
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS	63.5	64.0
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	66.0	53.0
3.18	WRITE LIBRARY ROUTINES	67.0	63.0
3.25	WRITE FORM TEST PATTERN ROUTINES	68.0	70.0
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM	69.0	66.0
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	70.0	74.0
2.05	PREPARE A DECISION TABLE	71.0	69.0
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE	72.0	67.0
6.10	PREPARE PRINTER CARRIAGE TAPE	73.0	72.0
2.04	PREPARE A GRID CHART	74.0	71.0
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	75.0	75.0

I M P O R T A N C E

ITEM NO.	TASK DESCRIPTION	GRAD RANK	EMP RANK
4.04	CORRECT LOGICAL ERRORS	01.0	03.0
4.01	READ A PROGRAM LISTING	02.0	01.0
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	03.0	04.0
4.02	DESK CHECK A PROGRAM	04.0	02.0
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	05.0	11.0
4.09	TEST PROGRAM USING TEST DATA	06.0	05.0
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	07.0	08.0
3.26	USE CODING SHEETS	08.0	07.0
4.10	TEST PROGRAM USING LIVE (USER) DATA	09.0	06.0
6.03	PERFORM PROGRAM MAINTENANCE	10.0	12.0
2.08	PREPARE A TEST DATA FOR PROGRAMS	11.0	09.0
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	12.0	13.5
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	13.0	17.0
3.20	WRITE COMMENTS IN PROGRAM	14.0	10.0
3.16	WRITE ERROR ROUTINES	15.5	19.0
3.22	WRITE EDIT ROUTINES	15.5	15.5
4.07	READ A FILE DUMP	17.0	15.5
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	18.5	22.5
4.08	READ A CROSS-REFERENCE LISTING	18.5	22.5
6.02	PATCH COMPUTER PROGRAMS	20.0	48.0
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	21.0	21.0
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	23.0	46.0
4.06	READ A MEMORY DUMP	23.0	32.0
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	23.0	20.0
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	25.0	13.5
3.12	USE TAPE FILE HANDLING ROUTINES	26.5	34.0
3.17	USE LIBRARY ROUTINES	26.5	29.5
3.05	USE DISK SORT UTILITY ROUTINES	28.0	29.5
3.15	WRITE SUBROUTINES	29.0	32.0
1.03	WORK WITH USERS ON PROBLEM	31.0	52.0
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	31.0	42.5
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	31.0	24.5
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS	33.0	42.5
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	34.0	27.5
1.10	PREPARE A DISK RECORD LAYOUT	35.0	48.0
3.13	USE CARD FILE HANDLING ROUTINES	36.5	41.0
3.14	USE DATA COMMUNICATIONS ROUTINES	36.5	52.0
3.06	WRITE TABLE BUILDING INSTRUCTIONS	38.0	38.0
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES	39.0	32.0
1.08	PREPARE A PRINTER SPACING FORM	40.0	36.0
2.10	SELECT FILE ORGANIZATION & ACCESS METHODS FOR DATA FILES	41.0	26.0
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART	42.0	24.5
1.01	USE COMPANY SYSTEM STANDARDS	43.0	27.5
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	44.0	44.5
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	45.0	58.0
1.09	PREPARE A TAPE RECORD LAYOUT	46.5	39.0
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	46.5	39.0
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM	48.0	64.5
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	49.0	54.0
2.01	USE STANDARD FLOWCHART SYMBOLS	50.5	44.5
3.04	USE TAPE SORT UTILITY ROUTINES	50.5	56.0
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	52.0	61.0
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	53.0	62.0
1.07	PREPARE A CARD RECORD LAYOUT	55.0	49.5
4.05	READ A TRACE	55.0	49.5
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	55.0	40.0
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	57.5	36.0
2.06	DIVIDE A PROGRAM INTO MODULES	57.5	47.0
6.07	USE VIRTUAL STORAGE TECHNIQUES	59.0	60.0
3.19	USE MACROS	60.0	52.0
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS	61.0	66.0
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM	62.0	56.0
1.06	PREPARE A SYSTEM FLOWCHART	63.0	56.0
3.08	WRITE TABLE SORTING INSTRUCTIONS	64.0	63.0
3.18	WRITE LIBRARY ROUTINES	65.0	64.5
3.23	WRITE CHECK DIGIT CHECKING ROUTINES	66.0	68.0
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	67.0	59.0
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	68.0	67.0
3.25	WRITE FORM TEST PATTERN ROUTINES	69.0	70.5
6.01	KEYPUNCH PROGRAM	70.0	73.0
2.05	PREPARE A DECISION TABLE	71.0	69.0
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE	72.0	70.5
6.10	PREPARE PRINTER CARRIAGE TAPE	73.0	72.0
2.04	PREPARE A GRID CHART	74.0	74.0
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	75.0	75.0

FUTURE NEED

ITEM NO.	TASK DESCRIPTION	GRAD RANK	EMP RANK
4.04	CORRECT LOGICAL ERRORS	01.0	05.0
4.01	READ A PROGRAM LISTING	02.00	07.0
4.02	DESK CHECK A PROGRAM	03.00	03.5
4.09	TEST PROGRAM USING TEST DATA	04.5	06.0
6.06	USE JOB CONTROL LANGUAGE (CONTROL CARDS)	04.5	21.0
5.02	WRITE COMPUTER OPERATOR INSTRUCTIONS	06.00	17.0
3.02	WRITE HIGHER LEVEL LANGUAGE INSTRUCTIONS	07.00	03.5
2.07	USE STRUCTURED PROGRAMMING TECHNIQUES	08.5	08.0
2.08	PREPARE A TEST DATA FOR PROGRAMS	08.5	02.0
3.20	WRITE COMMENTS IN PROGRAM	10.00	10.5
1.03	WORK WITH USERS ON PROBLEM	11.5	19.0
6.03	PERFORM PROGRAM MAINTENANCE	11.5	16.0
5.03	WRITE DOCUMENTATION UPDATES AFTER A PROGRAM REVISION	13.00	15.00
1.05	WORK WITH OTHER PROGRAMMERS ON PROBLEM	14.00	13.00
3.14	USE DATA COMMUNICATIONS ROUTINES	15.00	01.00
3.16	WRITE ERROR ROUTINES	17.00	24.00
3.22	WRITE EDIT ROUTINES	17.00	22.00
4.10	TEST PROGRAM USING LIVE (USER) DATA	17.00	13.00
4.03	CORRECT SYNTAX (CLERICAL) ERRORS	19.00	19.00
1.01	USE COMPANY SYSTEM STANDARDS	20.00	09.00
5.01	PREPARE A PROGRAM DOCUMENTATION MANUAL	21.00	13.00
3.15	WRITE SUBROUTINES	22.5	19.0
3.17	USE LIBRARY ROUTINES	22.5	26.5
3.05	USE DISK SORT UTILITY ROUTINES	24.00	35.00
4.07	READ A FILE DUMP	25.00	26.5
1.04	WORK WITH SYSTEMS ANALYST ON PROBLEM	26.00	10.5
3.10	USE INDEX-SEQUENTIAL DISK FILE HANDLING ROUTINES	27.00	33.00
4.12	RECOMMEND CORRECTIONS OR MODIFICATIONS TO PROGRAMS	28.00	24.00
3.09	WRITE SEQUENTIAL DISK FILE HANDLING ROUTINES	30.00	40.00
3.11	USE RANDOM DISK FILE HANDLING ROUTINES	30.00	31.5
4.06	READ A MEMORY DUMP	30.00	45.00
4.08	READ A CROSS-REFERENCE LISTING	32.00	42.00
2.09	SELECT APPROPRIATE DATA NAMES FOR DATA	33.5	24.00
3.25	USE CODING SHEETS	33.5	38.00
6.02	PATCH COMPUTER PROGRAMS	35.00	57.00
1.10	PREPARE A DISK RECORD LAYOUT	37.00	28.5
3.06	WRITE TABLE BUILDING INSTRUCTIONS	37.00	34.00
3.07	WRITE TABLE SEARCHING INSTRUCTIONS	37.00	31.5
2.02	PREPARE A GENERAL (LOGIC) PROGRAM FLOWCHART	39.00	44.00
3.21	WRITE INSTRUCTIONS FOR INTERNAL/EXTERNAL CONTROLS	40.00	38.00
3.12	USE TAPE FILE HANDLING ROUTINES	41.00	53.5
1.08	PREPARE A PRINTER SPACING FORM	42.00	41.00
5.04	SUMMARIZE THE CONTROLS IN PROGRAM TO DETECT ERRORS	43.00	28.5
1.06	PREPARE A SYSTEM FLOWCHART	44.5	46.00
2.10	SELECT FILE ORGANIZATION & ACCESS METHODS FOR DATA FILES	44.5	30.00
6.07	USE VIRTUAL STORAGE TECHNIQUES	46.00	48.5
2.06	DIVIDE A PROGRAM INTO MODULES	47.5	36.00
4.11	EDIT PROGRAM FOR EFFECTIVE USE OF AUXILIARY STORAGE	47.5	48.5
1.02	WRITE A DETAILED DESCRIPTION OF A PROBLEM	49.00	43.00
2.01	USE STANDARD FLOWCHART SYMBOLS	50.00	50.00
5.05	SUMMARIZE CALCULATIONS USED IN PROGRAM	51.00	38.00
1.09	PREPARE A TAPE RECORD LAYOUT	52.00	55.00
3.18	WRITE LIBRARY ROUTINES	53.00	47.00
2.03	PREPARE A DETAIL PROGRAM FLOWCHART	54.00	53.5
4.05	READ A TRACE	55.00	51.00
3.19	USE MACROS	56.00	52.00
3.04	USE TAPE SORT UTILITY ROUTINES	57.00	64.5
6.08	PERFORM NUMBER SYSTEM ARITHMETIC	58.00	61.00
1.07	PREPARE A CARD RECORD LAYOUT	59.5	60.00
3.13	USE CARD FILE HANDLING ROUTINES	59.5	62.00
3.08	WRITE TABLE SORTING INSTRUCTIONS	61.00	58.00
6.09	CONVERT NUMBERS BETWEEN NUMBER SYSTEMS	62.00	64.5
3.24	WRITE CHECK POINT-RESTART INSTRUCTIONS	63.00	56.00
3.23	WRITE CHECK DIGIT CHECKING ROUTINES	64.00	67.00
6.05	OPERATE COMPUTER FOR PROGRAM TESTS	64.00	66.00
3.01	WRITE ASSEMBLER LANGUAGE INSTRUCTIONS	66.00	69.00
2.11	SELECT APPROPRIATE PROGRAMMING LANGUAGE FOR PROBLEM	67.00	63.00
3.25	WRITE FORM TEST PATTERN ROUTINES	68.00	70.00
3.03	WRITE REPORT PROGRAM GENERATOR LANGUAGE INSTRUCTIONS	69.00	59.00
6.04	CONVERT A PROGRAM TO ANOTHER LANGUAGE	70.00	73.00
2.05	PREPARE A DECISION TABLE	71.00	68.00
6.01	KEYPUNCH PROGRAM	72.00	72.00
6.10	PREPARE PRINTER CARRIAGE TAPE	73.00	71.00
2.04	PREPARE A GRID CHART	74.00	74.00
1.11	PREPARE A PAPER TAPE RECORD LAYOUT	75.00	75.00

APPENDIX Q

LETTER FROM RESPONDENT

February 19, 1976

Dear Sir:

I am filling out this form for two of my employees. I have answered these questions assuming the entry-level programmer was hired upon graduation. My answers would have been more optimistic if this programmer had gone through operations first. I am a former graduate of then K.I.T., and started as a computer operator. It has benefited me and all others who entered operations as an entry to programming.

I wish the teachers would stress the importance of a good computer background. The background I am speaking of is the contact with the computer, the test procedures, the operator instructions, the data network, the user contact and the scheduling and flow of work across the computer.

I believe the teachers are advocating immediate entry into programming from school, as my last search for prospective computer operators at Gateway was fruitless. This was very discouraging as our salary and benefit program, along with the opportunity for advancement, is very adequate.

I, as programming supervisor, can attest to a good operations background.

Thank you,

Boyd Klofenstine

sb